CONVENTION ISSUE

# INFORMATION LETTER

Not for Publication — NATIONAL CANNERS ASSOCIATION — For Members Only

No. 1526 — Washington, D. C. — February 28, 1955

# Proceedings of the 48th Annual Convention

Relations with the consumer, the trade, and the grower were highlighted in several of the programs of the 48th Annual Convention of the National Canners Association in Chicago, February 19-23. Making records for attendance, sessions dealing with these subjects played to capacity audiences and received enthusiastic attention. The general reaction of N.C.A. members to practically all of the sessions, including the series of Raw Products and Laboratory conferences, as well as the meeting of the fishery products group, was one of approval, and it was commented frequently that the quality of NC.A. Convention programs has consistently improved in the past three years.

Attendance of the over-all Convention, embracing the annual convention of the National Food Brokers Association, and the meeting and 4½-day exhibit of the Canning Machinery and Supplies Association, was unofficially estimated at about 18,000 persons, about normal for this annual event.

1955 OFFICERS OF THE N.C.A.
*(left to right)*
Vice President William U. Hudson, President George B. Morrill, Jr., and Secretary-Treasurer Carlos Campbell

## General Session

The annual business meeting of the Association was conducted as part of the General Opening Session Saturday morning, February 19, in the Williford Ballroom of The Conrad Hilton, with President E. E. Willkie as presiding officer. Chairman Fred C. Heinz brought in the report of the Nominating Committee, naming George B. Morrill, Jr., of Burnham & Morrill Co., Portland, Me., as 1955 President; William U. Hudson, Gerber Products Company, Oakland, Calif., Vice President; and Carlos Campbell, Washington, D. C., Executive Secretary-Treasurer; and the new slate of 1955 Directors. Elections were unanimous, and the new officers were installed. Mrs. Margaret F. Counter, Fort Lupton Canning Company, Fort Lupton, Colo., acting for Chairman H. J. Barnes of the Resolutions Committee, read and moved adoption of the N.C.A. Convention resolutions.

Mr. Willkie then introduced the first guest speaker, Ralph D. Paine, Jr., publisher of *Fortune* magazine, New York City, whose address pointed up the future promise in the growing food market, citing the extraordinary increase in the proportion of income spent for food at a time when total disposable income is rising rapidly. The speaker stated that the food industry was the first to do something about the profound changes that are occurring in American so-

# George B. Morrill, Jr., Elected 1955 President of N.C.A.; William U. Hudson Chosen Vice President

George B. Morrill, Jr., of the Burnham & Morrill Company of Portland, Maine, was elected 1955 President of the N.C.A.

He succeeds E. E. Willkie, president of Pacific American Fisheries, Inc., of Bellingham, Wash.

William U. Hudson, first vice president of the Gerber Products Company in charge of production and research, Oakland, Calif., was elected 1955 Vice President.

Carlos Campbell of Washington, D. C., was continued in office as Executive Secretary-Treasurer.

The N.C.A. membership elected 22 Directors to new terms and 2 Directors to fill unexpired terms; the terms of 45 members of the Board of Directors were held over.

President Morrill, Vice President Hudson and the newly-elected Directors were the unanimous choice of the Nominating Committe, of which Fred C. Heinz was chairman.

GEORGE B. MORRILL
*1955 President*

### George B. Morrill, Jr.

Mr. Morrill is a third generation member of the family that helped to found Burnham & Morrill Company more than 100 years ago.

After finishing at Yale University, he worked for two years in the research department of the American Can Company at Maywood, Ill.

On entering Burnham & Morrill, he worked first in manufacturing and later in sales work. He entered the general management of the firm in 1948 as vice president. He has been a director of Burnham & Morrill since 1937.

Mr. Morrill served two terms in the Senate of the State of Maine, 1943-47. From 1944 to 1950 he served as a director of the New England Council. He was elected Maine vice president of the Council in 1949 and again in 1950.

Mr. Morrill served for a number of years in committee work for the Maine Canners Association and in 1951 was elected its vice president. He then was elected to two successive terms as president, 1952-53.

In 1946 Mr. Morrill was elected to a three-year term on the N.C.A. Board of Directors and also served on the Board Apportionment Committee, whose recommendations are the basis for the present Board structure. He also was a member of the Executive Committee, 1946 and 1947.

Mr. Morrill served on the Convention Committee, 1948-53, and was its chairman in 1951. He also served as a member of the Finance Committee, 1946-47 and 1952-53, and on the Administrative Council, 1952-53.

### William U. Hudson

Mr. Hudson was born in Montpelier, Vt., and studied mechanical engineering at the University of California from which he was graduated in 1920. His school career was interrupted by service during World War I as an artillery lieutenant.

Mr. Hudson entered the canning business in 1922 as superintendent of Winters Canning Co., Suisun, Calif. He then served from 1929 to 1933 as general superintendent of Hunt Bros. Packing Co., San Francisco. In 1934, with associates, he organized The Elmhurst Packers, Inc., in Oakland and served as vice president and production manager. He assumed his present duties with Gerber Products Company in November, 1943, at the merger of Elmhurst and Gerber.

He is, in addition, a Gerber director; director of the Gerber-Ogilvie Company of Niagara Falls, Canada; and a trustee of The Gerber Baby Food Fund.

Mr. Hudson has served on the N.C.A. Administrative Council, and on the Raw Products Committee, Western Laboratory Committee, and the Western Technical Committee on Baby Foods, of which he was chairman, since 1952. Prior to that time he had given service on the Western Branch Laboratory Advisory Committee and the Western Laboratory Building Committee.

## Convention Proceedings

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ciety. "You were there with new products, better products, products better designed for the servantless society, the growing middle-income market, for the suburban market, for the baby boom, for the working-wife market, even for the all pervasive barbecue market," he stated. Mr. Paine enumerated the factors that strongly favor the future of the food industry —population growth, the increase in productivity, the achievement of "the first, and still the only consumption economy in the world." He said that "The primary job in business today is to keep the consumer buying, to keep him buying steadily, and to persuade him steadily to buy more."

### Secretary Humphrey's Speech

The Honorable George M. Humphrey, Secretary of the Treasury, explained the fiscal policies of the present Administration, using a novel speech method based on the radio-TV quiz technique, asking the questions most frequently put to him and furnishing immediate answers—on efforts to balance the budget, on reductions in government spending, on defense and security budgets, on foreign aid, tax reductions, debt limits, actions against inflation, and other items.

As to the future situation for the nation's economy, the Secretary said that the most important thing in promoting a high level of employment and business activity is the people's confidence in their government, in each other and in the future. With such confidence, he stated, they will expand their activities, invoke new initiative and try new ways of doing things. As they continue to find their confidence justified, they will not only save money but will invest their savings. "This will provide the funds to produce the tools and power for the new plants, new equipment and new and better ways of making more things. This will lead to greater production, greater earnings of more people to pay for more consumption of more things and so in turn make more and better jobs. A man can earn more only if he can produce more. As we produce more we will all have more. If we maintain confidence in the stability of our system, there will be more and better earnings for both the workers and the investors."

Mr. Humphrey stated that in general the economy is moving upward on a broad front. It never moves in a smooth, straight line, up or down, he stated, but "as long as our broad movement is upward we are moving in the right direction. If government, business, labor, farmers and all our citizens remain both confident and reasonable in their demands upon the

whole economy, we should be able to maintain this upward trend, and supply the rightful demands of an ever-growing population."

### Canner-Grower Relations

In the canner-grower session of Saturday afternoon, canners were treated to a panel discussion that brought forth various viewpoints on how farmers can be persuaded to grow crops for canneries. W. Stanley Macklem, Chairman of the N.C.A. Raw Products Committee, presided over the panel which consisted of the following speakers, listed with their subjects:

Mark H. Mitchell, The Larsen Company, Green Bay, Wis., "Financial and Material Services as Inducements to Growers;" James D. Swan, Jr., president of the Vegetable Growers Association of America, Delavan, Wis., "Grower-Processor Relations from the Standpoint of the Vegetable Grower;" Hamilton Carothers, Office of Counsel, N.C.A., "Contracts as an Element of Canner-Grower Relations;" and Dr. H. L. Stier, Director of the N.C.A. Division of Statistics, "Effective and Accurate Presentation of Crop Statistics to Growers."

### The Merchandising Session

At the same time, in another part of the hotel, problems of merchandising that beset the smaller canner, and the opportunities offered by the institutional markets were being aired.

The merchandising session was arranged by Dr. Stier and the Dudley, Anderson & Yutzy organization. William A. Free, Sr., Chairman of the N.C.A. Consumer and Trade Relations Committee, presided. On the previous day, the Board of Directors had approved the 1955 budget for N.C.A. which provided for continuation through this year of the C.&T.R. canned foods promotion program.

**CARLOS CAMPBELL**

*Executive Secretary and Treasurer*

The current question to be answered by the smaller canners of the nation is not "can" they merchandise effectively but "will" they, it was agreed by the panel of experts, who appeared at the merchandising session.

In the first report of findings of N.C.A.'s cost-of-handling study on canned foods, Donald W. White, president of Don White, Inc., stated that the canning industry's primary job with retailers is to revitalize their interest in canned food products from the point of view of their promotional value, their fast turnover, low handling costs and the resulting net profit opportunity they offer.

The study which has just been completed consisted of personal interviews with owners and/or executives of 247 independents, voluntary and cooperative groups and corporate chains operating 34,113 stores and supermarkets. Of these, only about 5 percent keep separate records of sales and expenses of the canned foods department.

This means that few real facts are available about the actual cost of handling or net profit possible from the canned foods department as compared with the figures available for the meat, produce, dairy and bakery departments.

While the attitude of retailers is basically friendly to canned foods, as the survey points out, it is the taken-for-granted category in the grocery store, Mr. White declared. Despite the fact that most retailers think of canned foods as profitable, most of them also state that they are allocating the same amount of space for canned foods in the future as in the past, although they will increase space for such items as frozen foods and non-foods. Canners have a great merchandising opportunity if they will sell retailers on canned foods with the same enthusiasm as the manufacturers of non-canned foods do—with less dollars-and-cents reason.

J. Sidney Johnson, National Biscuit Company, New York City, gave smaller canners seven principles for setting up an effective marketing program:

(1) Make sure you have proper financing.

(2) Set up a standard of quality that big competitors will have difficulty matching.

(3) Limit your sales to a territory which can be economically covered.

(4) Select your brokers with particular care.

(5) Be equally selective of your customers.

**WILLIAM U. HUDSON**

*1955 Vice President*

(6) Take pride in being small, growing and flexible.

(7) If you are not yourself a good sales and merchandising man, hire a young man to build an aggressive merchandising program for your business.

Picking the right type of broker is an important decision for the smaller canner, E. Norton Reusswig, Lestrade Bros., New York City, pointed out. Some concerns are better geared to smaller operations than others, and some have personnel particularly experienced in the smaller canner's problems. They know the pulse of the market and the particular customer outlets best suited to the smaller canner's offerings.

The smart smaller canner earmarks on a per case basis a nominal sum of monies for promotional work, Mr. Reusswig declared. He invites brokers in for regional sales meetings to discuss practical ways and means to further promote distribution and wisely spend the allocated funds. He is in constant contact with his brokers in all chief markets, spending time with them covering important customers. He is ready and willing to adapt his sales policies to the flexible trend of the times.

Speaking on the subject of the canner's relationship with the grocery buyer, Wilda A. Coleman, Mick-Or-Mack Stores, Salem, Va., pointed out that canners should recognize the buyer's problems, should spend time in the store, acquaint themselves with their customers' methods of operation and merchandising policies.

The product must be pre-sold to Mrs. Consumer before she walks into the store. It should have something

*(Please turn to page 143)*

# N.C.A. Resolutions Deal with Canner-Grower Interests, Interstate Trade Barriers, and Publicity for Canned Foods

At the annual meeting the N.C.A. membership unanimously voted resolutions dealing with the community of interest between grower and canner, interstate barriers by particularized state requirements, and publicity for canned foods.

These resolutions were among those reported by the Resolutions Committee, of which H. J. Barnes is chairman. The report was presented by Mrs. M. F. Counter, a member of the Committee, who read the full text of the resolutions.

### Community of Interest Between Grower and Canner

The canning industry is ever aware of its community of economic interest with the growers who supply its raw material and for whose production it affords an essential marketing outlet. Canner and grower alike encounter the vagaries of nature and hazards of agriculture. Inescapably their prosperity is tied together. Inevitably control or regimentation that adversely affects the canner will rebound to the disadvantage of the grower. By the same token what invades the freedom of the farmer disserves the canning industry. Only together, in recognition of their common interests, through cooperation rather than opposition, can each foster the prosperity of the other. To a better development of that understanding this Association pledges its full energies and effort.

### Interstate Barriers by Particularized State Requirements

Consumer interest in both effective competition and the widest availability of all food products necessitates that any informatively labeled wholesale food be permitted to be sold freely throughout the United States. State or local regulations that impose requirements needlessly extending the adequate protections afforded by federal law serve only to hamper and to impede the free interstate distribution of canned foods. The National Canners Association urges upon all state legislatures, administrative agencies, and local officials these paramount consumer interests. Any regulation that specifies particularized labeling requirements, or prohibits ingredients authorized by federal law, or standardizes products to reflect local preferences, creates unwarranted interstate barriers and defeats the interests of consumers, canners, and growers alike.

### Publicity for Canned Foods

The maintenance of high quality, adequate production, and the efficient marketing of canned foods at reasonable prices continue to enable this industry to satisfy the constantly growing consumer demand for its products. Through the individual initiative and economic courage of thousands of canners, the average workers' earnings today can purchase far more canned fruits, vegetables, and other canned products than ever before. Through its continued research and improved processing techniques, the industry is even better enabled to bring to the table of the American housewife the harvest of the field and the catch of the sea. During 1954 the Association made great strides in demonstrating to the American housewife and the distributing trades the manifold advantages of canned foods. In this promotional work it has effectively met its continuing responsibility for public education by efficiently disseminating all available information through every effective public and trade medium.

For the success of these efforts the Association and the industry are immeasurably indebted to many. Seldom before has the industry so vastly benefited by the combined efforts of the Association's Consumer and Trade Relations Committee, its Home Economics, Information, and Statistics Divisions, and its independent consultants. All canners join in highly warranted commendation for this achievement.

### Edward E. Willkie

The stature of an office is largely measured by what a man brings to it. Abundant indeed were the gifts brought by Edward E. Willkie to the Presidency of this Association. His deep sincerity was always manifest in forthright expression of sound conviction. His vigor and vitality infused and stimulated every activity of the Association and the industry. Big in heart and mind as well as in body, his directness of purpose and sure insight into the problems of this industry have offered a steady guide to wise conduct. Nor has uncompromising integrity prevented the unfolding, on public platform and in inner council, of the welcome richness of his humor. With affectionate regard the canning industry expresses its gratitude to Edward E. Willkie for the privilege of having had his qualities of leadership and of sharing so richly in his genial wisdom.

### The National Canners Association Staff

Effective fulfillment of the Association's obligation to the public and to the industry requires the untiring efforts of its capable staff. The ever-increasing value of its services is a tribute to the continued excellent performance of many difficult assignments. The Association expresses its appreciation to Carlos Campbell and his staff for their loyalty, industry, and efficiency in carrying out their duties.

### Guest Speakers and Allied Trades

The success of a National Canners Association Convention derives from the hard work and cooperative spirit of many diversified elements. Our guest speakers, the allied industries, newspapers, radio, television, and the trade press have each effectively contributed to the success of this 1955 Convention. The Association is sincerely appreciative for all that they have done and directs the President and Board of Directors to convey its gratitude to each of them.

### In Memoriam

As the canning industry and this Association grow in strength and in years, time takes its inexorable toll of friends and fellow workers. The warmth of their friendship endures along with the worth of their work. In deep sorrow we mourn the passing of

Frank Armstrong, Sr.
William E. Braithwaite
William Clapper
G. H. Clark
Berkeley A. Davis
Dr. J. Russell Esty, of the N.C.A. Staff
Jay E. Fitzgerald, of the N.C.A. Staff
Strickland Gillilan
W. F. Gohlke
J. Howard Hamilton
Dana M. Hubbard
Edward H. Jacob, Sr.
Wilbur P. Kappler
Harvey H. Leininger
W. L. Rowlands
Norris H. Sanborn, of the N.C.A. Staff
Elton S. Shaw
Frank M. Shook
William J. Underwood

# N.C.A. ANNUAL MEETING

PRESIDING: E. E. Willkie, 1954 President, N.C.A.; Pacific American Fisheries, Inc., Bellingham, Wash.

GREETINGS: President Willkie

REPORT of the Committee on Nominations: Fred C. Heinz, Chairman; H. J. Heinz Co., Pittsburgh

ELECTION of Officers

ADDRESS by Ralph D. Paine, Jr., Publisher, *Fortune* Magazine, New York

ADDRESS by The Honorable George M. Humphrey, Secretary of the Treasury

REPORT of the Committee on Resolutions: H. J. Barnes, Chairman; Kaysville Canning Corp., Kaysville, Utah

INSTALLATION of New Officers

E. E. WILLKIE
*1954 President*

## Greetings to the Convention Delegates

**By E. E. Willkie,
1954 President,
National Canners Association**

Welcome to the 48th Annual Convention. We have several very able men to talk this morning, so my remarks will be brief. During the course of this program I will graduate to that class of elder statesmen—there is nothing deader than a dead president, or an ex-president, but I want to take this opportunity to thank the membership for having let me serve them as their President during this past year. It has been a very stimulating and pleasant experience.

We have a very fine Convention; optimism fills the air. They tell me that for the first time in a generation the economists have all agreed that business is good; business is going to stay good. The statisticians tell us that there is an ever-expanding population and in the next 25 years we are going to have to produce 40 percent more food than we are producing today. Truly the country and the canning industry have a very bright future. I am optimistic. With the statisticians and with the economists I believe that we have a very bright and glorious future. But when you and I go back home to get to our individual problems, our own specific problems, let us remember that in this industry 99 percent of demand means life, liberty and the pursuit of happiness; 110 percent of demand means failure and fear and futility. Let us remember that the successful operator is the operator who maintains that delicate balance between supply and demand; the man who packs what he can sell and sells what he packs at a profit. Let's not leave any casualties behind; let's all go forward together.

I thank you.

## Presentation of Gift to President Willkie

**By A. O. Verbeke**

When Carlos Campbell asked me a few days ago to make some remarks on the occasion of Ed Willkie's relinquishing to his successor the office of President of this Association, I realized I had a tough job. I supposed I was to say something complimentary. Ordinarily it is not too difficult to have something good to say about anybody, but I have probably had more contact with Ed Willkie than anybody else in this meeting and most of that time he has given me trouble.

As most of you know, for a good part of our working life Ed and I were associated together in the same company until Ed started to look for greener pastures, or perhaps I could more accurately say, bigger fish. For a time both of us were in the export end of the business and when he was brought back from Europe and kicked upstairs I took over his old job in Belgium and immediately had the task of correcting all of his mistakes.

Later there were quite a few years Ed had jurisdiction over production of the goods I had to sell, so he was always wanting me to get prices up when the obvious answer was reduction of his costs.

When that relationship ended, I thought I was through with him but now for the last year I have had to work for him on the Board of Directors of the National Canners Association.

I am sure by now none of you believes a word of what I have said. And you are right. My long relationship with Ed Willkie has been a pleasant one and I am sure Carlos Campbell called on me on this occasion because that long relationship has made me better able to appreciate Ed Willkie as both an able executive and a gentleman.

This big country boy from Indiana started making a name for himself from the time he played in the line for the midshipmen's football team. After his stint as a naval officer, he came with the company with which I am now associated and at a relatively early age became a vice president and director. At a time when I know it was a real sacrifice to spare the time from his job as chief executive officer of his present company, he consented to serve as President of this Association. When I say he has done an outstanding job, I know I am only repeating what is already common knowledge.

So to you, Ed Willkie, it is my pleasant task on behalf of the members of this Association to say thank you for a job well done and, as a distinguished member of a distinguished family, I expect we will be hearing a lot more of you before you decide to devote the rest of your time to raising Aberdeen Angus on that farm down in Virginia.

As a memento of this occasion, I have been asked to present you with this set of luggage as a gift from the Association and its members. I think the selection is an appropriate one, for I suspect that with all the traveling you have had to do during your year in office you have about worn out what you now own. Be that as it may, it gives me a great deal of pleasure to be able to present this token of esteem from your fellow canners.

## N.C.A. Board of Directors

At the annual meeting, the N.C.A. membership elected 22 to three-year terms on the Board of Directors and 2 to two-year unexpired terms. Together with 45 holdover members, following is the Board as now constituted:

NEW DIRECTORS

Frederick Bird, Medomak Canning Co., Rockland, Maine

Charles S. Bridges, Libby, McNeill & Libby, Chicago, Ill.

M. E. Brooding, California Packing Corp., San Francisco, Calif.

Carlton Clifton, Carlton Clifton & Sons, Milford, Del.

Robert C. Cosgrove, Green Giant Company, LeSueur, Minn.

George Davidson, Foster Canning, Inc., Napoleon, Ohio

Ralph Day, Marshall Canning Co., A Div. of Consolidated Food Processors, Inc., Hampton, Iowa

Samuel E. W. Friel, S. E. W. Friel, Queenstown, Md.

Henry McK. Haserot, Hawaiian Canneries Co. Ltd., Kapaa, Kauai, T. H.

Richard R. Hipke, A. T. Hipke & Sons, Inc., New Holstein, Wis.

Wesley Jense, Pleasant Grove Canning Co., Pleasant Grove, Utah

Max Lehmann, Northwest Packing Co., Portland, Oregon

T. N. Lyons, Morgan Packing Co. Inc., Austin, Ind.

D. E. Martinelli, Lake County Cannery, Inc., Upper Lake, Calif.

Walter W. Maule, Mushroom Cooperative Canning Co., Kennett Square, Pa.

Arthur Mendonca, F. E. Booth Co., Inc., San Francisco, Calif.

B. E. Richmond, Richmond-Chase Co., San Jose, Calif.

Daniel Rosenbaum, Sugar Rose Canning Co., Tampa, Florida

C. L. Rumberger, H. J. Heinz Company, Pittsburgh, Pa.

Ryland Thomas, Griffin Manufacturing Co., Muskogee, Okla.

Elmer Williams, DeJean Packing Co., Braithwaite, La.

Walter W. Wilson, Silver Creek Preserving Corp., Silver Creek, N. Y.

DIRECTORS
ELECTED TO FILL UNEXPIRED TERMS

Irving Goldfeder, Hunt Foods, Inc., Fullerton, Calif.

W. Allen Markham, Markham Bros. & Co., Okeechobee, Fla.

DIRECTORS WHOSE TERMS HELD OVER

Charles Alhadeff, Whiz Fish Products Co., Seattle, Wash.

Joseph F. Barker, The Utah Canning Co., Ogden, Utah

W. E. Beach, McKeon Canning Co., Inc., Burbank, Calif.

Fred C. Bush, Bush Brothers & Co., Dandridge, Tenn.

Hamilton C. Davis, Walnut Creek Canning Co., Walnut Creek, Calif.

John E. Dodds, Schuckl & Co., Inc., Sunnyvale, Calif.

A. M. Erickson, California Production Div., Hawaiian Pineapple Co., Ltd., San Jose, Calif.

Thomas E. Evans, Reinbeck Canning Co., Reinbeck, Iowa

Peter Filice, Filice & Perrelli Canning Co., Inc., Richmond, Calif.

Walter Friend, Friend Brothers, Inc., Melrose, Mass.

John E. Frost, Delta Canning Co., Inc., Raymondville, Texas

W. T. Dixon Gibbs, Gibbs & Co., Inc., Baltimore, Md.

Percy W. Gould, Franklin Farms Products Co., Farmington, Maine

J. William Hathaway, Hathaway Bros., Columbia Falls, Maine

John Hauser, The C. H. Musselman Co., Biglerville, Pa.

John C. Hemingway, H. C. Hemingway & Co., Auburn, N. Y.

Karl A. Hirzel, Hirzel Canning Co., Toledo, Ohio

F. Lowden Jones, Walla Walla Canning Co., Walla Walla, Wash.

Leon C. Jones, J. R. Simplot Co., Caldwell, Idaho

L. M. Jones, Washington Canners Cooperative, Vancouver, Wash.

Marvin H. Keil, Green Giant Company, Beaver Dam, Wis.

Ralph Keller, Geo. A. Hormel & Co., Chicago, Ill.

Glenn Knaub, P. J. Ritter Co., Bridgeton, N. J.

Charles O. Koller, Charles G. Summers, Jr., Inc., New Freedom, Pa.

Ray Krier, The Krier Preserving Co., Belgium, Wis.

Edwin C. Kraus, Big Stone Canning Co., Ortonville, Minn.

James B. Lane, Westgate-California Tuna Packing Co., San Diego, Calif.

Elton Lasselle, Portland Canning Co., Inc., Sherwood, Ore.

J. F. McIntosh, Baldwin Packers, Ltd., Lahaina, Maui, T. H.

R. A. Moss, Woods Cross Canning Co., Clearfield, Utah

W. Ennis Parker, Pomona Products Company, Griffin, Ga.

George O. Robey, Kemp Bros. Packing Co., Inc., Frankfort, Ind.

A. J. Rogers, Cherry Growers, Inc., Traverse City, Mich.

Richard Schlecht, Rossville Packing Co., Rossville, Ill.

John Seuerth, Gerber Products Co., Fremont, Mich.

George C. Seybolt, Wm. Underwood Co., Watertown, Mass.

G. Bartol Silver, Charles B. Silver & Son, Havre de Grace, Md.

Vance F. Sutter, Fidalgo Island Packing Co., Seattle, Wash.

William B. Swonger, The St. Mary's Packing Co., Sidney, Ohio

M. K. Tescher, Kuner-Empson Co., Brighton, Colo.

Donald E. Tobin, Victor Preserving Co., Ontario, N. Y.

G. A. Turmail, Bluffton Foods, Inc., Bluffton, Ind.

Andrew Washburn, A. Washburn & Sons, Bloomington, Ill.

S. G. Wimmer, S. G. Wimmer & Son, Christiansburg, Va.

Fred T. Wright, Beaver Valley Canning Co., Grimes, Iowa

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## 1955 Finance Committee

The personnel of the Finance Committee was approved at the annual meeting. As announced by President Morrill, it is as follows:

E. E. Willkie, Pacific American Fisheries, Inc., Bellingham, Wash., *Chairman*

H. J. Barnes, Kaysville Canning Corp., Kaysville, Utah

John L. Baxter, H. C. Baxter & Bro., Brunswick, Maine

E. B. Cosgrove, Green Giant Company, Le Sueur, Minn.

Howard T. Cumming, Curtice Brothers Co., Rochester, N. Y.

S. B. Cutright, Illinois Canning Co., Hoopeston, Ill.

Ralph O. Dulany, John H. Dulany & Son, Inc., Fruitland, Md.

William A. Free, Sr., Hungerford Packing Co., Inc., Hungerford, Pa.

R. A. Friend, Friend Brothers, Inc., Melrose, Mass.

Dan Gerber, Gerber Products Co., Fremont, Mich.

Walter L. Graefe, Pomona Products Company, Griffin, Ga.

G. Sherwin Haxton, Haxton Foods, Inc., Oakfield, N. Y.

Fred C. Heinz, H. J. Heinz Company, Pittsburgh, Pa.

W. U. Hudson, Gerber Products Co., Oakland, Calif.

Marc C. Hutchinson, Michigan Fruit Canners, Inc., Fennville, Mich.

Adolph C. Ketzler, Bordo Products Co., Chicago, Ill.

H. F. Krimendahl, Stokely-Van Camp, Inc., Indianapolis, Ind.

D. P. Loker, Star-Kist Foods, Inc., Terminal Island, Calif.

Roy G. Lucks, California Packing Corp., San Francisco, Calif.

John F. McGovern, Green Giant Company, Le Sueur, Minn.

Ivan Moorhouse, Olympia Canning Co., Olympia, Wash.

Fred M. Moss, Idaho Canning Co., Payette, Idaho

Maxwell N. Naas, The Naas Corp. of Indiana, Portland, Ind.

Robert C. Paulus, Paulus Bros. Packing Co., Salem, Ore.

Louis Ratzesberger, Jr., Illinois Canning Co., Hoopeston, Ill.

B. E. Richmond, Richmond-Chase Co., San Jose, Calif.

Emil Rutz, Schuckl & Co., Inc., Sunnyvale, Calif.

R. L. Smith, Kuner-Empson Co., Brighton, Colo.

Henry P. Taylor, Taylor & Caldwell, Inc., Walkerton, Va.

A. O. Verbeke, Libby, McNeill & Libby, Chicago, Ill.

H. L. Wedertz, Lakeside Packing Co., Manitowoc, Wis.

Frederick R. Weisman, Hunt Foods, Inc., Fullerton, Calif.

J. B. Weix, Oconomowoc Canning Co., Oconomowoc, Wis.

Oliver G. Willits, Campbell Soup Company, Camden, N. J.

E. B. Woodworth, Hawaiian Pineapple Co., Ltd., San Francisco, Calif.

Ray A. Yocom, Consolidated Food Processors, Inc., Chicago, Ill.

## The Canner in a Consumption Economy

**By Ralph D. Paine, Jr., Publisher, Fortune Magazine**

It is a very high honor indeed you have conferred by asking me to appear on this program. There seems to be no argument whatever that the Annual Convention of the National Canners Association is the largest business convention in America. And that is saying quite a lot.

In addition to the honor of participating in this biggest of conventions, there is the very special honor of appearing on the same program with the Secretary of the Treasury. What I really mean is this particular Secretary, not just any Secretary of the Treasury. I don't think it will haunt him if I say that he is the best Secretary of the Treasury in the 25 years of *Fortune's* history.

Of course I know why I am here; I'm here to get out of the way as gracefully as possible so you can hear what Mr. Humphrey has to say. I feel the same way. So, without wasting any more of your time, I will tender a few observations on the food industry which, in all its manifestations, is by far the largest industry in the country. And the food industry in the U. S. since the war has confounded both the laws and the prophets.

If I talk more about the food market in general than about the canning industry in particular, it is because I know a little more about food than canning, which of course isn't saying much. Some of my associates, however, have studied this phenomenon in some detail and are still following it closely because food has played such an important role in this rapidly changing American market.

And the first big point about the food market, as you know, is that, contrary to all historical experience, the American people have increased the proportion of their income spent on food at the same time that their total disposable income was rising, and rising rapidly. How extraordinary this is can be seen when you realize that there was a well-recognized economic formulation to the opposite effect: Engel's Law said that the higher a family's income, the smaller the percentage allocated for food. The corollary to Engel's Law, namely that the smaller the percentage of national income spent on food, the more advanced the nation, that went out the window, too. In 1941 Americans were spending 24 percent of their cash income for food. At one point right after the war the figure reached 30 percent for some pretty special reasons which you all recall, but by 1953 it had stabilized at 27 percent. And 3 percentage points applied to total consumer cash income at recent rates is roughly $7 billion, which is the equivalent of a pretty good sized industry in itself.

Let me emphasize that this $7 billion more or less is in addition to the tremendous expansion which would have occurred if the food industry had simply maintained its relative market position. Rising consumer income would have guaranteed a great shift to better and higher priced foods; it would also have guaranteed a vast expansion in the convenience market.

Now, as we all know, Americans still only eat approximately three-quarters of a ton of food per year. They eat better food and they are eager to pay for service, preparation, processing—built-in c o o k i n g—heat and serve, thaw and heat, add water, add milk and bake and what have you. But how did you get them to spend the $7 billion more?

This is unquestionably the outstanding selling job of postwar America. And by selling I use *Fortune's* definition of salesmanship: "everything that contributes to the salability of a product from the time it is conceived until it is finally used up or worn out."

Apparently the food industry was the first to sense the profound changes that were occurring in American society and the first to do something about it. You were there with new products, better products, products better designed for the servantless society, the growing middle-income market, for the suburban market, for the baby boom, for the working wife market, even for the all pervasive barbecue market. And it cannot be contradicted that you sold superly, for the food industry was taking its rising share of the market, from the clothing industry, from the home goods industry and from the automobile industry. A really tremendous achievement.

But what do you do now? The food industry was in there first after the war but other industries are beginning to catch on to this changing American market.

There are some indications that the terrific drive for automobile sales in 1955 may be at the expense of food. The clothing industry is also out in force to regain some of the ground it lost to food. What is the food industry going to do about it?

Before even suggesting an answer, I think it might be profitable to review a few underlying f a c t o r s which strongly favor the food industry.They are all familiar to you but they are worth recalling for this discussion.

(1) The upward trend in the rate of population growth is irreversible for another generation. This works in favor of the food industry, day after day, week after week, year after year. No other industry is such a sure beneficiary of population growth as food. And the birth rate has been so high for so long that even if it dropped off unpredictably—and there is no reason to suppose it will—another upward surge will certainly occur when all the war and postwar babies start having babies of their own. A U. S. population of 200,000,000 or more within 20 years seems inevitable.

Moreover there is a sizable expansion in the food market due to start very soon. That expansion will occur as the 37 million postwar babies develop teen-age appetites. Children are such a large proportion of the population today that the food market has yet to benefit in full from population growth. For children do eat less than adolescents and adults. *Fortune* estimates that there is a good $2 billion additional expenditures for food coming up as the food intake rises from the 2,000 calories per day for a 6 year-old to the 3,800 of a 17 year-old boy.

Another way of putting it is that from now well through the 1960's the rise of the food market should increase about 3 percent faster than population.

(2) Productivity is rising faster than population. Output per man hour on average is increasing at an accelerating rate. We used to think 2 percent per year compounded yielded a pretty fair standard of living. There is now good reason to believe the figure is nearer 3 percent.

That is of great significance to the food industry, for it offers assurance

that the U. S. people will not revert to lower food standards. Three quarters of a ton of corn meal, sweet potatoes, turnip greens and salt pork per person will support life after a fashion, but there isn't much profit in it for the canning industry.

(3) The U. S. has arrived at a true consumption economy. The first, and still the only, consumption economy in the world.

Our problem is to get people to consume what we can produce. In the rest of the world the problem is to withhold enough from consumption to accumulate the capital by which production may be increased. In communist Russia capital formation is achieved by government fiat; the standard of living is kept at a bare minimum, with the result that capital investment there is running very high. Throughout Asia and the Middle East the margin is so thin that capital formation is pitifully small.

In the U. S., by contrast, we are over the hump; the more we consume, the more we can produce. In fact, if we don't consume, the whole machine begins to stall. Thrift is still a personal virtue, but the cold fact is that the American propensity to save is probably the most uncertain factor in this new American economy. The choice of spending or not spending is now available to most of the people of the United States over a very wide range of purchases. And they are prone to fads.

You know what happened to butter, and to potatoes. Suppose this crazy backyard barbecue thing went so far that men started to cook food instead of play with it? Men want their raw materials raw; no cans for them. You would be in serious trouble.

Consider what would happen if any very considerable number of people decided to make the old car do for one more year, to put up another year with that old 21-inch television, to carry on with that old non-electric range? These are not very hard choices for Americans to make; a sudden national feeling that it was smart to be thrifty—for one year—would bring on a catastrophe that would shake the world.

### What Happened in 1951

How even moderate shifts in consumer attitudes can affect this new economy of ours was highlighted in a startling fashion in 1951. As you will recall, a good recovery from the 1949 readjustment was well underway by the spring of 1950. Then came Korea and a pretty wild six months of inflation, with little faith that the Truman Administration was going to be able to bring it under control. There was every reason to believe that people would continue to turn cash into goods, that is, continue their buying spree.

But what happened? As we put it in *Fortune*: "In March, 1951, the consumer clutched his pocketbook to his breast, spat in the face of world economic forces and began to save a higher proportion of his disposable income than he ever had in peacetime."

By April the American consumer was saving at the rate of $20 billion annually and for the balance of the year up to 9 percent of his disposable income. This was a turnabout of 4 percent in the saving rate from the previous year. It was a good thing for the country that he did; this unprecedented and unpredictable savings spree brought Mr. Truman's inflation to a sudden halt, much to the surprise, if not annoyance, of the Administration, which of course had the ground cut out from under its frantic appeals for a price freeze and direct controls.

It was a good thing for the country, that unpredictable savings spree, but

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it is frightening to think what would have happened to the economy had this occurred when defense spending was not rapidly expanding, which of course it was in 1951. If you were making or selling appliances you would have been acutely aware of the savings spree. For instance:

Refrigerator sales dropped from 6,200,000 units in 1950, "a scarcity year," to about 4,000,000 in 1951, a year of oversupply. Television sales dropped from 7,500,000 in 1950 to a little over 5,000,000 in 1951.

Some hard goods like freezers and unit air conditioners, it is true increased sales in 1951. It was also true that some companies did a better selling job than others. But generally speaking, 1951 was not a good year to be in the retail business. Yet the measurable difference in spending was around $6.5 billion, but that little 3 percent of consumer income carries enormous leverage.

### Implications for the Food Industry

The food industry, of course, is much more stable than consumer durables, and I am not suggesting any direct comparison. What I would like to suggest is the unpredictability of the American consumer—this new consumer who has such enormous reserves of optional buying power. The food industry, as I would like to repeat, has done a superb job of selling this new economy. And by selling I mean to include not only sales, advertising, promotion, and merchandising; I mean also continuing innovation and improvement to meet consumer needs and wants and tastes. Any industry which can shift its share of the entire consumer market 3 percentage points—up—is some industry.

And it would be a bold man who had the temerity to lecture it. But, as someone who is not in the food industry, I feel I should point out that food is now taking such an extraordinary share of the consumer dollar that, in a very real sense, everyone else in the consumer field has to sell against food.

Can the food industry continue to hold its 27 percent of the consumer dollar? Or will Engel's Law—that food expenditures drop relatively with rising income—become valid once more in the U. S.? Income in the U. S. is bound to rise—barring war. Can food, can the canning industry hold its share?

Let me say hastily that I hope it does. (That is a paid advertisement for my associates on *Life* Magazine!) There is no limit in sight to the market for convenience. There is no limit in sight for rising quality. There is still an inordinate amount of time spent in the American kitchen—a form of labor which is considered so unproductive that it is not even entered in the columns of gross national product.

The larger question is how successful will our efforts be in selling what America produces. The limiting factor in this new consumption economy is not production but sales. There is hardly an industry in the country in which the production men are not itching to open the throttle. If they did, of course, we would all soon drown in a sea of surplus goods.

In the over-all, of course, the production process also produces the means to buy goods. But this marvelously tuned economy demands very close tolerances. Today the difference between prosperity and recession is very, very small when measured in terms of consumer spending.

Now consumer spending is not the only element in our prosperity. Capital goods and defense spending are both large factors. However, only one

man in this room has much influence on defense spending, and as for capital goods, that market depends largely on business expectations, which comes back pretty much to expectation of consumer behavior.

The primary job in business today is to keep the consumer buying, to keep him buying steadily, and to persuade him steadily to buy more.

On *Fortune* several years ago we asked ourselves this question: "Why do people buy?" That is, after people reach a point where they possess optional or discretionary purchasing power—and today almost everyone in the U. S. has that in some degree, and at least half the population has it to an important degree. After a prodigious amount of research, we came to a very simple and unavoidable conclusion: People buy because they are sold.

This we discovered had never been admitted by any respectable economists. For to economists, selling, the persuasive element of the distribution process, has always been laughed off as one of the excesses or exuberances of American capitalism. It is treated as "economic waste." It may be. But I find it very hard to believe that the entire apparatus of American salesmanship, advertising, promotion, merchandising and presonal selling has no power to influence the total consumption of goods and services. I not only find it hard to believe; I think it's nonsense.

If the apparatus of American selling did no more than keep a consumer spending 2 percent above what he would without it, then the apparatus of American selling is worth everything it costs.

If the apparatus of American selling can keep people buying, keep them buying steadily and steadily buying more, it will have worked a greater wonder in the world than American production.

Sell more canned foods. Sell better canned foods. But above all, sell. That way it can be truly said of you that what is good for the canning industry is good for the U. S. A.

## Address

**By The Honorable George M. Humphrey, Secretary of the Treasury**

I am delighted to have the opportunity to meet with the National Canners Association this morning.

I am greatly impressed with something I have just heard about your Association. I am told that your financial statement for the past year shows that you have operated with a budget that is balanced. To one who has the ambition to do likewise but is beset with all of the problems of the Secretary of the Treasury of the United States, that is something I note with great envy.

I am also glad to have this opportunity to see so many of my good friends of days that were more carefree and to have this chance to explain to such a fine group of leading businessmen as are here this morning some of the simple principles so vital to the successful operation of our economy which the Eisenhower Administration is trying to perpetuate and strengthen.

We live in an age of change, devoted to the use of new techniques. Now, as I am not an orator but at heart, and by experience, just a businessman like yourselves, to whom deeds mean more than words, I am going to choose a new technique in speaking to you this morning. It is the technique of the presently popular radio-TV quiz show. By using questions which I am constantly being asked by government officials, newsmen, members of Congress, and people like yourselves, I will try to inform you by my answers of our problems, our accomplishments, and our hopes.

Gentlemen: The stage is set. The clock is marking off the seconds. The klieg lights are on. The moderator is in his place. We are on the air and are ready for the first question.

Q. Mr. Secretary, please tell us, has the Administration abandoned its program of trying to balance the budget?

The answer to that is absolutely no. We are working, and with a reasonable amount of success, toward a balanced budget. The record shows that progress has been good, even though we have not reached the goal. The government's deficits have been cut substantially since we came into office. The deficit in fiscal 1953 was almost $9.5 billion. We could do very little about this in five short months as actual spending plans were committed beyond recall. However, the Eisenhower Administration did cut the deficit in the next fiscal year, fiscal 1954, down to $3.1 billion—or two-thirds of the way toward a balanced budget. It is true that the deficit in the present fiscal year (fiscal 1955) looks like $4.5 billion, but the new budget for fiscal 1956 again cuts the deficit to $2.4 billion. Both the present deficit and the deficit for the next fiscal year may be less than now estimated if revenue holds up and if we are able to cut spending further, as we are continuously trying to do.

Q. Why haven't we cut government spending faster?

The government can only reduce its expenses by putting people out of work, either directly or indirectly. This sounds harsh, but the fact is that the government spends most of its money for only two things: (1) the employment of people working directly for the government, or (2) the purchase of goods which are made by people who will be out of work if the orders for the goods are cancelled. Under these circumstances, it would not be prudent to cut government spending too fast, even if it were possible to do so. Of course the most important reason is that in these perilous times our first obligation to the nation is to provide adequately for our security. But there is another very important consideration that must be prominently kept in mind.

We must constantly have in mind in making these reductions the necessity of creating new employment to absorb those who will thus be out of work. There must be a great transition—moving people from working for the government, either directly or indirectly, in to jobs working for the production of goods for the general public. We have gone through two years of this transition with reasonable success. We are striving continually to do better and to make the transition with less loss of time for those directly involved. We cannot switch from years of deficit spending to a balanced budget in too short a time.

Q. Why has this Administration cut so much from the defense budget?

Sixty-five percent of our latest budget goes for major national security programs. This amounts to about $40.5 billion a year. Of the remaining $21.9 billion, $14.8 billion or 24 percent of the total budget goes for payment of interest on the debt and other charges fixed by law. That leaves only $7.1 billion, or 11 percent, of the total budget for other so-called civilian agencies of government. So, it simply follows that if any large cuts in spending are to be made, they must largely come—but carefully and wisely made—from the heavy total for defense.

Now, when we talk about "cutting" expense, let's always remember that does not mean cutting our effective defense. Let's recall how much stronger we are today than we were when Korea began in June of 1950. At the outbreak of Korea, our armed forces had less than 1.5 million men, equipped almost wholly with material of World War II manufacture. We now have 3,100,000 men in service, and our present target for 1956 is an armed strength of 2,860,000 men, or almost double the number of June, 1950. By the end of fiscal 1956 we will have an Air Force of 131 wings and 975,000 men as compared with 48 wings and only 411,000 men when the Korean fighting began. The Navy and Marines will be second to none (with 857,000 men). And the Army will be 80 percent above June, 1950, in manpower (1,027,000 as compared with less than 593,000), but of even greater importance is the fact that

because of advances in the science of warfare, each Army division will have 80 percent more firepower than a division of World War II.

To support these forces, we will spend an estimated $34 billion—almost three times what we were spending when Korea broke out. So the total in both personnel and money going into our defense forces today is comparatively substantially increased.

Q. Have we cut too much from our security?

No! The reductions that we have made in spending for defense have not reduced our armed strength. As the President has said, we are increasing it; this nation is in a stronger position to defend itself today than it was two years ago. We have a more flexible and better balanced defense establishment tailored to meet the requirements of future warfare and at lower cost to the taxpayers. Nothing that has happened in Formosa or elsewhere in the world up to this very day has changed our budget plans for lower spending in the year to come. I say this while emphasizing one basic fact: We can and will spend whatever we need to spend for our security. But this Administration is operating in the firm knowledge that real security comes not from merely spending billions of dollars but rather from spending them wisely.

What we are doing is shifting some of the emphasis from men to machines, from the old concept of slugging it out with masses of men to being ready to beat the enemy with mobility, technological know-how and the most modern superiority of weapons and equipment.

Q. Can't we cut spending and balance the budget by just eliminating all foreign aid?

That is a program which is often suggested but is neither simple nor wise to carry out if you just stop and think about it. Certainly it is better to put military equipment in the hands of our friends overseas so that they can help to defend themselves if the need comes, rather than to also send American boys to handle those weapons, with all the potential loss in lives and national wealth, as well as the human anxiety that is involved. Total expenditures for mutual security, including both military assistance and economic support, are estimated at $4.7 billion for fiscal 1956, including the provisions for a program in Asia. This compares with mutual security spending of $4.3 billion in the present fiscal year.

The total cost included in this program for economic assistance alone is $1,025 million in fiscal 1956 as compared with $1,075 million in the present fiscal year. The total estimated expenditures in 1956, not including obligations for the future, for all Asian economic assistance will be about $585 million as compared with about $500 million to be spent for economic aid in Asia in the present fiscal year. So, while the estimated over the actual spending for economic aid increases slightly in Asia, the over-all foreign economic aid program is still decreasing. This is directly in line with this Administration's conclusion that we can best serve the cause of the free world by helping its members to help themselves through selective development programs in which private investment can play the major role.

While significant accomplishments have been realized through foreign aid which are in the mutual interest of the United States and other free countries, history has sadly proved that large grant programs not only burden the American taxpayer but do not always produce either stronger or more friendly allies. The entire program is under intensive, continuing review to be sure that in the future both military and economic assistance may be properly balanced as operating parts of our foreign relations and defense programs.

Q. In view of the big reductions in expenditures that have been made could the budget have been balanced?

Yes! If we had not accompanied the heavy cuts we made in spending with substantial tax cuts, we would have balanced the budget. But we had to consider the proper balance in our sensitive economy. We knew that heavy cuts in government spending meant putting people out of work. We believed that we should cut taxes sharply and so give more people added money to spend for themselves to help create jobs for those who previously got their pay checks directly from the government or from government purchases. We cut taxes in calendar year 1954 by a total of $7.4 billion—the largest single dollar tax cut in history. We did this to help make possible the easier and quicker transition in jobs from high government spending to lower government spending. The fact that the economic downturn was so quickly checked and that we are now proceeding upwards on a broad front is proof that the policy of cutting taxes as we cut spending is a sound policy. The fact that consumer spending in the past year was the highest that it has ever been is also good evidence of how the tax cuts helped to make the successful economic transition.

Q. Will there be further tax cuts?

Not this year, if the Administration's recommendations are accepted by the Congress. The President has proposed that the corporate rate of 52 percent, as well as excise taxes which would go down on April 1, be continued for one full year. We are asking this because we think the current status of the economy will take it and because further tax reduction would lead to too heavy deficit financing and a possible revival of dangerous inflationary pressures.

This does not mean that taxes must not be cut further. They are still too high for the long run and must come down. As the President has said, we certainly hope that we can be planning additional tax reductions a year from now.

Q. If you are going to cut taxes further next year, how can you ever balance the budget?

That is a question we are often asked—and it is an important one. As I have said, we have not abandoned the goal of balancing the budget, and neither have we stopped cutting taxes. We can and will do both. We will keep trying to cut government spending further. At the same time our expanding economy can provide greater tax income even at lower tax rates because it is on a broader base. As this country continues to grow, there is no reason why we can't have both a balanced budget and lower tax rates provided only that world conditions continue to improve.

Let's notice here the difference between the administrative and the cash budgets. As long as the government is not taking out of the economy more than it spends, the government is not increasing the money supply and thus being inflationary. So when we have a balance in the cash budget (which includes the receipts of the trust funds such as social security) we have eliminated that particular inflationary pressure. We did have a cash balance between money collected from the public and money paid out by the government last year, although we will not quite have a cash balance this year. We estimate a small cash surplus in fiscal 1956. So that the inflationary effect of deficit financing will have been almost eliminated during the entire period this administration has been in financial control.

Q. Why do you have to raise the debt limit if you are really cutting spending as you claim?

When we came into office, there was $8 billion between the amount of the then-existing debt and the $275 billion debt ceiling. Now, in the very first year, the previous budget which we inherited turned out with a deficit of $9.5 billion. Actually there was little we could then do beyond carrying out the spending that had already been planned and paying the bills that were presented. We had no leeway under the debt limit as we entered our first full fiscal year, 1954, so we asked the Congress for an increase, as a matter of prudence as we looked ahead. As things came out in fiscal 1954, we cut the prior administration's $11 billion estimated deficit (after an over-estimate of revenue is figured in) to $3 billion—a cut of $8 billion. But even then we still had this $3 billion deficit that had to be put on top of the $9 billion deficit that we inherited from the preceding year. These two things, plus the wide seasonal variations in collection of corporate income taxes, made some elasticity in the debt limit

absolutely essential. Congress recognized this and last year authorized a $6 billion temporary increase in the limit on the condition that the debt would go back to the $275 billion limit at the end of this fiscal year.

This year we estimate a $4.5 billion deficit, which we hope we may cut a little, as I have said. And in fiscal 1956 we are estimating a smaller deficit of $2.5 billion or less. But regardless of the size of the deficit and the reductions we are making, each deficit pushes up our debt still further, and so involves the problem of what to do about the debt limit. It will be with us acutely again this June.

Q. Is borrowing outside the debt limit necessarily improper?

No, not necessarily. If the government borrows outside of the regular debt for something which must be paid back from general funds, it is and would be improper. But if the government is acquiring or operating "earning assets," it is perfectly proper that they should be independently financed.

For example, if a toll road is built and the tolls to be collected are sufficient to meet the debt service, both principal and interest, required to amortize the debt that is created to pay for the road, it is a perfectly clear case of a proper independent financing of an earning asset. Now, the toll to be collected can be based on weight or axle charge, on a mileage basis, or on any other suitable measure of use, including the consumption of oil and gasoline.

If the collections made under such a measure of use are dedicated in good faith to meet the debt obligations that are incurred, it is a perfectly proper way to independently finance debt required to pay for roads. Moreover, the entire economy is benefited: First, by the construction of the road and its employment of men and materials; second, by the use of the road and its benefits to transportation; and, third, by the liquidation of the cost of the road through a user tax measured by gas and oil, rather than by placing an additional burden on the back of the general income taxpayer.

Q. Is the government improving its debt structure?

Yes. The enormous debt is too heavy in short-term maturities. These can be inflationary as well as the source of trouble and possibly real danger to our whole economy under certain circumstances with so many short maturities. We are making progress slowly in lengthening the average maturities, and we must move slowly so as not to upset our sensitive economy. The 40-year 3 percent bonds just issued have been a real step forward. The issue was a great success. It has lengthened the average maturity of our whole marketable debt from four years and two months to four years and nine months. It is the longest government bond issued since 1911 when some 50-year bonds were issued to help finance the Panama Canal. This issue, like all our financing operations, had to be rightly timed for market conditions which were appropriate to be sure that we did not interfere with other financing requirements and so affect the economic situation in an unfavorable way.

Q. Will there be more long-term issues?

Yes. It is our firm goal to continue to lengthen the maturities of the debt as rapidly as appropriate conditions permit. The issue last week was the

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second long-term issue we have put out. The first was the 3¼ percent 30-year bond in the spring of 1953. We will have more when and as the conditions make it appropriate. We want to have varied types of issues so that all types of investors will have appropriate government securities in which to put their funds. This will spread the debt as widely as possible among the largest number of investors so as to both finance the debt and promote sound economic growth.

Q. Have we permanently stopped inflation?

That depends upon the courageous and tenacious will of the great majority of the American people to do so. The lure of inflation is something that is never permanently killed. It beckons like a siren to enticing evil ways. Unless continuously watchful resistance is always exerted, the weak may fall for its false promises of ease to riches and be led down the primrose path to their ruin. It means the destruction of savings, which make investment possible, which in turn makes jobs. When we jeopardize the making of ever more and better jobs in America, we are ruining the very foundation of this republic.

Our record of the past two years has been good. The value of the dollar has changed less than one-fifth of one cent between January, 1953, and today. This compares with a loss of 48 cents in the value of the dollar from 1939 to the time when this administration took office. Inflation will stay checked only if we continue to actively resist the things which bring inflation about. Government must continue to cut down deficit financing and to handle its debt in a proper way.

The Federal Reserve System must continue to use wisely its money and credit responsibilities so that the economy of the nation can operate with the minimum of regulation. Savings must be protected. Investment must be encouraged by a great and ever-growing group of both large and small investors, and more and better jobs will thus be created to produce more goods for better living for more and more Americans.

Q. Isn't a little inflation a good thing?

No, it is not, and such thinking is very dangerous. I know there are millions of Americans who are earning more dollars today than they did 20 years ago. That's good. In many cases there is a real improvement in that they have better homes, automobiles, and so forth. But the fact that this increase in dollar income has been accompanied by less value of the dollar must be considered. In addition, the large numbers of persons on fixed incomes and persons who have put aside savings for retirement and old age have been cruelly hurt by inflation taking away 48 cents of each dollar they saved 15 years ago.

Fortunately, inflation has now been stopped. As economists of the American Federation of Labor put it recently, according to press reports: "Unionized labor fared better in 1954 on the wage front than in any other postwar year. Higher hourly wages and stable living costs had given most workers their greatest postwar gain in purchasing power. This was true even though the average pay rise of 5-9 cents per hour was modest in comparison with increases in previous years. Last year the wage-earner got the full benefit of a fatter pay envelope. In other years inflation gobbled up much of his gain."

There is nothing academic about this point because America today is a nation of earners and of haves rather than have-nots. Most Americans today are saving several dollars a week out of their pay and putting it in insurance policies, retirement funds, and so forth. The recurrence

of inflation would rob millions of people of their savings.

Q. What is the prospect for more jobs in this country?

The prospect for jobs is very closely related to what I have just been talking about. Probably the most important thing in promoting a high level of employment and business activity is confidence—people's confidence in our government, confidence in each other, and confidence in the future.

If the great bulk of the American people are reasonably confident of the future they will expand their activities, invoke new initiative and try new ways of doing things. As they continue to find their confidence justified, they will not only save money but will invest their savings. This will provide the funds to produce the tools and power for the new plants, new equipment and new and better ways of making more things. This will lead to greater production, greater earnings of more people to pay for more consumption of more things and so in turn make more and better jobs as the years go by. A man can earn more only if he can produce more. As we produce more we will all have more. It we maintain confidence in the stability of our system, there will be more and cheaper goods produced through more and better jobs and with more and better earnings for both the workers and the investors.

Q. What is the economic outlook today?

The economic downturn of last year is behind us. In general, the economy is now moving upward on a broad front. There are some lines and areas which are still depressed. Unsolved problems still remain on which we are diligently working. Unemployment in January was 3,300,000, an increase of 500,000 over the previous month and an increase of 200,000 over January a year ago. But as concrete evidence of the economy's upward movement, employment in January was 60,200,000, or 400,000 higher than in January a year ago. The economy never moves in a smooth straight line, up or down, but as long as our broad movement is upward we are moving in the right direction. If government, business, labor, farmers and all our citizens remain both confident and reasonable in their demands upon the whole economy, we should be able to maintain this upward trend, and supply the rightful demands of an ever-growing population.

# CANNED FOODS MERCHANDISING

PRESIDING: William A. Free, Sr., Chairman, N.C.A. Consumer and Trade Relations Committee; Hungerford Packing Co., Inc., Hungerford, Pa.

ADDRESS: "Merchandising Opportunities in the Low Handling Costs of Canned Foods"—Don White, Don White, Inc., New York

PANEL DISCUSSION: "Can the Smaller Canner Merchandise?"

PANEL MEMBERS: J. Sidney Johnson, National Biscuit Company, New York; E. Norton Reusswig, Lestrade Bros., New York; Wilda A. Coleman, Mick-Or-Mack Stores, Salem, Va.; Lyman L. Weld, Feature Merchandising, Inc., Chicago; Ralph A. Head, Batten, Barton, Durstine & Osborn, New York; Grace White, *The Family Circle* Magazine, New York

## Merchandising Opportunities in the Low Handling Costs of Canned Foods

**By Donald W. White, Don White, Inc.**

For 20 years, canners have watched the development of a paradox in food and grocery retailing.

This paradox was the increase in big-volume, low-cost self-service retailing, and the decrease in retail emphasis on the merchandising of canned foods.

It was perfectly logical for food and grocery retailers, whose industry has the smallest profit margins of any retail industry in the United States, to seek new sources for extra volume and extra earnings from new food products and from nonfood products.

It did not seem logical, however, to see these otherwise very efficient retailers losing sales and profit opportunities by:

(1) Cutting down the percentage of retail store floor and shelf space devoted to canned foods,

(2) Cutting down the proportion of storewide promotions of canned foods, and

(3) Cutting down the proportion of advertising and merchandising expenditures for canned foods.

It did not seem logical because today's low-cost, self-service food and grocery retailing can only survive and grow on its very small percentages of profit by means of the kind of fast turnover, big-volume, adequate gross profit margin and low handling costs offered by canned foods.

Analysis of existing data, supplemented by a careful, personal-interview pilot study among retailers showed that out of the welter of trade statistics there was:

(1) Considerable data on store sales, sales per square foot, turnover, and gross profit margins, but

(2) Little or no information on the relative retail handling costs or net profits for various departments, let alone for various commodity groupings such as canned foods.

This preliminary work made it clear that the "missing golden link" between sales and net profits for many food and grocery retailers—large and small—was this missing information about the wide differences in the retail handling costs of their various departments and the major product classifications within those departments.

This work also made evident that until more exact information about such handling costs could be obtained, the opinions of retailers without the facts could be as important to their merchandising policies affecting canned foods as the actual facts possessed by only a very small minority.

The result of this reasoning was authorization by N.C.A. of the "National Study of the Attitudes and Practices of Food and Grocery Retailers With Respect to the Retail Handling Cost of Canned Foods."

With field work starting in the fall of 1954, this study was based upon extensive qualitative personal interviews with owners or executives of retail food and grocery operations including single store independents, voluntary chains, cooperative groups and corporate chains with particular emphasis on multiple-unit retailers. Interviews covered 247 organizations, in 24 states and in all of the 9 major U. S. Census areas, affecting the operation of a total of 34,113 stores.

Advance appointments were made with each respondent, and each one was asked a number of questions call-

ing for intimate top-level knowledge of confidential operating information.

Because this study sought information about handling costs and other retail data involving tabulation and accounting, it was interesting to learn that a fairly high percentage (33 percent) of the headquarters of corporate chains, voluntary chains, and cooperative groups are reported to have modern, high-speed, machine tabulating equipment such as that made by I.B.M. or Remington-Rand.

With such high-speed tabulating equipment in only one-third of these multiple-unit retailing organizations, it was not surprising to learn that a majority of them report that they do not allocate fixed overhead expenses or handling costs by items, commodity groups, or even by departments (66 percent on fixed overheads, and 69 percent on handling costs).

Of all retailers interviewed, only 1-out-of-20 (5 percent) of them keep any separate sales and expense records for canned foods, while the great majority of them (92 percent) lump canned foods records with "groceries," including everything from cereals and soaps to syrups and sugar.

Largely because of this lack of specific sales and cost data for canned foods, many retailers interviewed felt that they could not give even a qualified opinion on the relative handling costs of canned foods. Among the rest, however, the ranking of commodities or departments thought to have the lowest retail handling costs is as follows:

| Commodity or Department | Percent of Retailers |
|---|---|
| Non-foods * | 34 |
| Bakery products * | 24 |
| Canned foods | 23 |
| Frozen foods | 6 |
| Dairy products | 5 |
| Groceries, non-canned | 5 |
| Produce | 3 |
| Meat | 1 |

* Handled partly or wholly by manufacturer or rack jobber.

Canned foods are also credited by nearly one-half (49 percent) of all retailers with from 20 percent to 40 percent of their total sales and an average of 31 percent for all retailers reporting.

Again, canned foods are rated very favorably on "fast turnover" but with a very wide range, up to 52 turns per year, with the average for all retailers given as 15.3 turns per year.

On the score of gross profit margin, canned foods are reported to yield an average for all retailers of 15.2 percent or approximately 10 percent higher than the 13.7 percent reported for groceries, non-canned.

Canned foods furthermore are ranked first in yielding the best total-net-dollar-profit by a larger proportion of all retailers (25 percent) than any other products or departments, including meats and produce.

On top of all this, a majority of retailers (57 percent) feel that canned foods share of their total sales during the next five years will be as good or better than it is at present.

In view of all these factors favorable to canned foods, it is startling therefore to see that a majority (56 percent) of these retailers also state that the amount of space in their stores is being kept the same for canned foods, and that canned foods head the list of items for which retailers currently are decreasing space.

| | Increasing | Same | Decreasing |
|---|---|---|---|
| | (*percent of retailers*) | | |
| Canned | 19.8 | 56.3 | 6.5 |
| Frozen | 46.9 | 27.1 | 1.0 |
| Nonfoods | 22.3 | 52.6 | 2.0 |

A partial clue to this contradiction of retailers' favorable attitudes toward canned foods, but their increased emphasis on other items, may be seen in their replies to a question about their merchandising policies.

The question was, "Which one single factor would you say is the most important in determining your company policy with respect to giving extra sales and merchandising emphasis to a particular type of product or to a particular department?" Here are the answers:

| Ranking | Most Important Factor | Percent of Retailers |
|---|---|---|
| (1) | Fast turnover | 39 |
| (2) | High gross profit margin | 18 |
| (3) | Big gross dollar volume | 15 |
| (4) | Dramatic promotion values | 11 |
| (5) | Big share of net profit dollars | 8 |
| (6) | Low handling costs | 6 |
| (7) | Miscellaneous | 3 |

To the man who believes that any business should be operated to make even a small net profit, the ranking of these responses might make grocery retailers look like philanthropists, or like the fellow who lost money on every sale but was happy because he made so many sales.

In summing up, this high-spot preview of results of the N.C.A. study of retailer attitudes and practices with respect to canned foods shows:

(1) Widespread lack of accounting procedures and facilities that would permit more than the present small number of retailers or retail organizations to accurately measure the low handling costs and high earning potentials of canned foods.

(2) A surprising lack of concern among retailers about "net-profit-dollars" in shaping their merchandising policies.

(3) An extremely favorable attitude toward the advantages of canned foods on the part of a majority of retailers, even with incomplete accounting information.

(4) Greater merchandising interest on the part of retailers in non-canned foods that lack the sales, handling cost and earnings advantages of canned foods.

(5) Canners, as a result of these conditions, appear to be confronted with one of the greatest merchandising opportunities in the history of the canning industry by:

(a) Revitalizing retailers' enthusiasm about the advantages of canned foods that they now take largely for granted.

(b) Matching the sales, sales promotion and merchandising ideas and drive exhibited by manufacturers of noncanned foods and nonfood products that have been getting increased retail space and retail merchandising support with less dollar-and-cents reason than canned foods.

(c) Supplying more factual information about the retail sales, handling costs and earnings potentials that can result from increased merchandising emphasis on canned foods.

## Can the Smaller Canner Set Up an Effective Marketing and Distribution Pattern?

**By J. Sidney Johnson,**
**National Biscuit Company**

I am going to ask six questions. If you are a smaller canner, I want you to answer these honestly in your own mind.

First, is your business adequately financed? If the market for your product or products breaks, are you then forced to unload stocks in order to cover your financial obligations?

Second, can you assure your customers a continuous, steady supply? Will a crop failure or labor strike put you completely out of business for an entire season?

Third, do you find it difficult to get good brokerage representation because your volume is limited and not attractive to aggressive brokers who are out to make big money?

Fourth, do your freight rates make it necessary for you to confine your sales to a circumscribed area in order to operate profitably?

Fifth, is your primary interest in production? Are you a good salesman yourself? If not, are you willing to employ competent men to sell and merchandise your pack? Do you have an aggressive merchandising program? Do you do any advertising or

demonstrating to establish your brands with the consumer?

Sixth, now be honest with this one, do you imitate the big canners in your operating methods? Do you follow their pricing policies? Do you attempt to match their quality? In other words, do you follow or lead in your merchandising methods?

I have been frank in asking you to answer these six questions honestly in your own mind. However, I hope you do not feel that I am indicting you. I believe that the smaller canner not only can but many of you already have set up effective marketing programs. Let me spell out the competitive advantages which I think every smaller canner enjoys.

### Competitive Advantages of the Small Canner

I should like to quote from my good friend, Don Lloyd, general manager of the Associated Food Stores of Salt Lake City: "The greatest asset of the small canner reported by our buyers is their flexibility. They are not bound by rigid, arbitrary policies and are usually willing to recognize local marketing conditions. This flexibility frequently enables us to do a good merchandising job on the products of our small canners."

"Large bodies move slowly." The alert small canner can out-maneuver his big competitors, if he's on the ball. That's the first and big advantage you enjoy.

In the second place, you can be more selective among prospects than your big competitors. You can select the distributor or distributors in each market who can give you the best representation and the maximum sales. The big fellow can't do that. He must do mass selling in order to match his mass production output.

Third and most important, the smaller canner with limited production can develop unusual and distinctive products that the large canner cannot easily match with his mass production facilities. And (here I expect to stir up vigorous objections from the big canners) you as a smaller canner can actually produce the same products with superior quality.

A small fruit canner in California is doing just that—canning nectar peaches, fancy Elbertas, and nectarines. The products are so outstanding and the quality so superior that he actually has no real competition from the big canners. This canner is so exacting in his requirements that he actually operates 400 acres of farm land himself.

"King's X!" Now I know some giant in the canning industry is going to land on me and tell me to stick to my crackers and cookies.

But the canner sold me, and the things he told me are borne out in my own canning experience. The big canners can't pay their operators more for the careful harvesting of fully ripe fruit. This smaller canner says the extra cost of careful harvesting is negligible because the large operator loses more down the drain or through lower grades because he cannot exercise sufficient care.

In the New York market, one brand of tomato juice outsells many competitors and at a higher price, perhaps because the company has higher standards of quality. Anyway, they're smaller canners and they seem to be doing all right.

### An Effective Marketing Program

Here's how I'd set up an effective marketing program, if I were a smaller canner:

First, I'd make sure I was properly financed. I know that's a tough one, but believe me there's plenty of money around this country today and no matter how much difficulty you have had in the past, you can get the money.

Second, I'd set up a standard of quality that my big competitors would have great difficulty in matching. You can do that too, just as the small fruit canner in California and others are doing successfully today.

Third, I'd limit my sales to territory that I could be sure to cover economically, where freight rates were favorable. I wouldn't try to "cover the waterfront."

Fourth, I'd select my brokers with particular care. There are brokers who like to sell superior quality and who will be satisfied to work with a smaller canner whose standards are so high that over the years his volume will grow.

Fifth, I'd be equally selective of my customers. I was in food distribution for 17 years and I know there are many who appreciate quality. Just a tip, look for wholesalers who have good voluntary or cooperative groups or a selected group of good customers, and operators of sectional supermarkets, who want to build a reputation for extra fine quality.

Sixth, it goes without saying that I would forget about the large national advertisers. I wouldn't ape their methods nor try to meet their prices. Let the big fellow be big. He has all the handicaps of rigid, arbitrary national policies. As a smaller canner, I would take pride in being small, growing and flexible. I'd set my own standards and work hard to live up to them.

I remember when Green Giant (then Minnesota Valley), was a small canner. They did everything different from the big fellows. And everybody laughed at them and predicted they would fail. But they didn't

Seventh, if I were a smaller canner I'd admit that I know little or nothing about merchandising and advertising. I'd hire a smart youngster just out of college and let him do the job for me under a rigid budget. I'd expect him to build an aggressive merchandising program for my business.

In conclusion, I'll admit that it's easier to tell someone else how to run his business than it is to do it yourself. But you asked me to do it!

As I said at the start, the smaller canner can set up a successful marketing program, some of you have already done so, and others will never do it. Will you?

## Can the Smaller Canner Organize His Brokers Into an Effective Sales Force?

**By E. Norton Reusswig, Lestrade Bros.**

It is a pleasure indeed for me to become a participant in this panel discussion and to talk briefly upon a topic close to my heart. I've been in the food business all of my life and in the two very segments covered by this subject. I happened to start in as a small canner, no pun intended, at the tender age of 14. Then, at the more mature level of 28, I became a food broker and I've been at it ever since.

"Can the smaller canner organize his brokers into an effective sales force?" My answer is definitely "Yes!" All smaller canners can do it. But the unfortunate fact is that many canners do not properly coordinate their food brokerage representatives into an effective organization for sales and promotion.

You can spot the successful smaller canner every time by the company he keeps—his brokers and his customers. He is aggressive, progressive, and particularly receptive to the changing times and the new era of planned practical selling.

Let us start with the food broker. He is the man I like to describe as a chap who sells goods that don't come back to customers that do. He is an individual who is a trained specialist in the field of food. He has had real background experience in the preparation, selling and merchandising of

canned food items. He is in a position to talk intelligently, advise carefully and recommend correctly certain practical steps to be taken for the best interests of his principal, Mr. Smaller Canner.

But, in organizing an effective brokerage sales force, it's vital that you, the canner, pick the right type of food brokers. This is an important decision. In every market, there are competent and carefully trained brokers capable of being of great help. However, a study of the various brokerage organizations in a given market would probably indicate that some concerns are better geared to your smaller operations than others. Some organizations have personnel particularly experienced in the smaller canner problems. They know the pulse of the market and the particular customer outlets best suited to your offerings.

Picking the right broker means likewise that you must pick the right territories. Being smaller in scope, your packs must be merchandised and distributed in areas that will produce the most prosperous results. Weighing such factors as transportation costs, competitive brand and product situations, quick delivery services, the smaller canner must pick the best markets and the customers best suited for his products in those markets.

Thus we come to the third link in the organization of a successful sales force, the customer himself. The right kind of a customer is of utmost importance. Your broker's knowledge of his market and his customers can direct you toward selling your limited packs to selected buyers. They are the ones who have an appreciation, first of all that your success is their success, that your problems are of combined mutual interest and that you want them to realize that this is a long-range sales program, not just for the moment or for the season.

This is no place for the opportunist be he customer or canner out to make the devious dollar. There's no need to waste time here on the customers who are always looking for the bargains at your expense. This is a lasting sales promotional contract between canner and customer, wisely guided by the food broker and sealed three ways in confidence and integrity.

Here is the answer—the triumvirate of good customers, good markets, good food brokers. They all have to be jelled and coordinated by the good smaller canner to weld together a successful sales organization.

The wise canner, cognizant of the needs of his customers and dependent upon the sincere counsel of his food brokers, has to appreciate that selling today is not just selling but proper promotion and merchandising. The smaller canner should have no mistaken notion that these two words "promotion and merchandising" belong only to the giants of the canning industry. Nor should he be frightened by the mistaken idea that these two words are synonymous with financial disaster. They merely mean the follow-through and determination to insure the sales of the canner's products to the consumer, not just one time but repeatedly.

The smaller canner who is the smart canner would earmark on a per case basis a nominal sum of monies for promotional work. He would then invite his brokers to his factory for regional sales meetings. They would discuss the most practical ways and means to further promote distribution and wisely expend the allocated funds. There are many avenues of expression in this field and I am sure that my fellow panel members will be touching on many of them.

My chief concern is that our smaller canner should have the will and desire to take these steps for his long-range salvation. He should be in constant contact with his food brokers in all of his chief markets, spend time with them covering the important customers and be ready and willing to adapt his sales policies to the flexible trend of the times.

If I might proffer you a bit of parallel thinking, I would like to compare our problem here with, strangely enough, the movies. I think you'll agree that the trend of the current motion picture, with its three dimensions in technicolor, is a delightful and successful departure from the old order. Why could not the smaller canner plan a program that could be called "Sellescope," the science of selling canned foods that has the three dimensions of depth, color, and wide vision. For the depth, you have the "carry on" through the food broker, to the customer and consumer. For the color, you have the product appeal in top quality, attractively labeled and cased and displayed. For wide vision, you have the chain of mutual understanding and confidence that develops throughout the years to build up a continuous performance of satisfaction, salesmanship, and security. Given the right kind of an audience, every performance can be a sellout and every smaller canner a veritable star, richly deserving of applause and acclamation.

## Can the Smaller Canner Establish a Relationship with Buyers Which Will Result in More Effective Product Merchandising?

**By Wilda A. Coleman, Mick-Or-Mack Stores**

I should like to begin by telling you what may come as a complete shock to you: buyers really are human! The man who made the classic statement that an assistant buyer is merely a mouse in training to become a rat exaggerated.

And buyers, too, have problems. Their most acute problem today is space—space in their warehouse and space on their retail shelves. Retail shelf space has been said to be the world's highest priced real estate, and every buyer knows that his tenants who occupy it must pay the rent by rapid turnover.

Before the canner can hope to establish an effective relationship with buyers, he must recognize the buyers' problems. He must become acquainted with the buyer's company, his facilities, his handicaps, his problems. I am always disappointed when a salesman asks me, "Just what sort of set-up is your company, anyway? Do you own all those stores that bear your name?" On the other hand, an interview gets off to a propitious start when the salesman tells me something about my company which informs me he is interested in us and in our problems, not just requesting my interest in his company and its problems.

How much time are you spending in your customers' retail stores? Not to waste employees' time, but to acquaint yourself with your customers' methods of operation and merchandising policies. As a buyer, we must know something about your company. We think it only fair, and incidentally only good business, for you to know something about us before you come in to see us.

Once you have shown a genuine and sincere interest in your buyer and his problems, he is more ready to listen to your story of your company and what you can offer him as a solution to some of his own aches and pains.

Even if he wanted to, the buyer cannot help you merely because he likes you or because he is a good Joe. Today's competitive conditions at retail preclude the possibility of business built on sympathy. The retail grocer today cannot sell your item. He has no salespeople as such. All he can do is put the merchandise on his shelf and it must be pre-sold by you to Mrs. Consumer as she walks down the aisles of the store. Even if your advertising budget is severely limited, you still can pre-sell to a great extent.

First and foremost, you must have something a little better than average to offer your prospective new buyer and to his customers. It may be superior quality. It may be a lower price. It may be both. It has to be something to attract his attention, to make him willing to gamble some of his precious space on your label.

And speaking of labels: Make them attractive. Make them pull the eye. Make them colorful and descriptive. Buy a good label, a superior label to your competitors'. If it contains a picture of the prepared product, make it the most mouth-watering, appetizing picture it is possible to make. We have turned down many new items with no more than passing interest in the contents of the can because the label was unattractive and of poor color.

Once you have convinced your buyer that you have something special to offer him in the way of quality and/or price, convince him that your label is in his market to stay. We cannot afford to stock a new item, see a demand built for that item, and then be unable to buy it another year. Let us know right in the beginning that we can count on you and your product, under the same label, for the years to come.

And this is difficult for the smaller canner, but we think it is imperative. Offer him your merchandise all the year around. Don't make him buy it all at once or be without it for months at a time. His warehousing space will not permit him to buy a year's supply of your item at one time.

Then, sell the buyer what he wants and needs, not what you want to sell him. This does not always please production managers, but it is the best way to build business for the long run.

And lastly, and by far the most important, build the buyer's confidence in you and in your integrity. This is not an overnight process. It comes slowly, but it is worth the effort. Your best bet to gain his early confidence is to pick the best possible broker for his area. In buying from a new supplier, we always prefer to buy through brokers. We know that a well-known, well-established brokerage house will not take on a manufacturer who is the least bit unethical in his dealings with the trade. We know that brokerage house will not risk his reputation and his future business potential with a buyer by representing a house that does not come up to par. When you have a good broker representing you, we have two-fold confidence, two people to fall back on in case we are not happy with the transaction. This is of even greater importance for the smaller canner than for the long established, nationally known packer.

Then, adhere to the same policy all of the time. For instance, do not prepay one shipment, and ship collect another. We think you do not know what you are doing, or we think you are trying to put something over on us.

Don't expand your markets so fast that your production cannot take care of the demands.

Please don't promise us something that you cannot come through on. If your pack is small, tell us in the beginning that you may not be able to take care of our future needs. Ship what you said you would when you said you would.

Lean over backward to fulfill to the most minute detail every promise you make. You may walk the second mile a number of times, but if you let us down just once on something we expect from you, that is what we remember.

The smaller canner has his problems, and they are acute. But the day of opportunity for the small businessman has not yet passed. We think the smaller canner is here to stay.

## Can the Smaller Canner Compete for Retail Merchandising Visibility?

**By Lyman L. Weld,**
**Feature Merchandising, Inc.**

The real question here is whether the big canners have quality of product, or influence, or selling "know-how," or finances which enable them to get more shelf or store visibility for their products than a smaller canner can hope to match—and therefore more opportunity for sales, inasmuch as today 50 percent to 60 percent of retail sales of canned fruits and vegetables are impulse purchases.

Like all questions of this kind, this also needs definition. I think we may presume that no smaller canner would attempt to compete with big canners in all major markets at once. So the real question is whether the smaller canner can compete successfully in any given market such as Buffalo, Denver, or Detroit; or in any limited number of regional markets.

Granted this limitation, the question might better be: "How can a big canner, attempting to cover the whole United States, compete with smaller canners who can concentrate on a limited number of markets and take advantage of every weakness in the big canners' organizations and operations—every opportunity the market affords?"

Generally speaking, you can put it down that the amount of shelf display or exposure which a product gets bears little relation to the size of the canner's plant, number of shares outstanding, or paid-in capital, or for that matter, the over-all reputation of the company and its products.

The number of rows, the retail shelf visibility is largely determined by the rate of movement of the product off the shelf, for the very obvious and practical reason that the store is so busy, if it has real volume, that it cannot keep restocking its shelves every few minutes. It has to allot enough space to a type of product and to a brand to take care of its business.

So, as a matter of saving its own labor, and giving its customers service the store allots most shelf space to the products which move fastest. There are exceptions, but they are usually temporary—even in the classic fight between private labels and national brands, whether in chains or independents.

The fight for retail shelf visibility actually is a fight for retail salability and whether the smaller canner can sell as many women on buying his brand as the big canner.

I think we shall have to presume that the smaller canner has a good product and keeps up his quality; that he has reasonable finances to buy advertising and promotion and demonstrations. There is no law which requires the smaller canner to bite off more than he can chew, and keep on chewing. So, if we presume that our smaller canner undertakes to compete with big canners only in markets where he can reach a substantial number of women with his advertising —regularly—and can keep it up not for 13 weeks or 6 months, but year in, year out, then some other important factors come into play.

I have never seen a large company which is not fallible. If I may mix a metaphor, large companies are Goliaths with Achilles heels. They have organizational changes which mean changes in contacts with buyers; difficulties in establishing and maintaining standards of quality sometimes. Too often their left hands don't know what their right hands are doing. Advertising and promotional drives are started without the local men in charge of sales even knowing that they are under way, let alone receiving help in taking full advantage of them. We are working right now with numbers of large companies, trying to coordinate our merchandising work with their advertising. We beg them for display material which we offer to put up, and can't get it, too often. When we do get it, we have

too much, too late. We beg for recipe books which we will put right into the hands of women in the stores, and most often can't get them. "What do you have?", we ask. "Give us something to work with, to get more women acquainted with your product." Often it is three months before we get something; sometimes it never comes. This lack of planning, of coordination between advertising, sales, and merchandising is wicked. It represents sheer waste, loss of power.

These are the things which give smaller canners their opportunity. Smaller canners can have a tight, easily controlled organization. No meetings to call to get authorizations; no buck-passing. They can work hand in glove with their brokers, make sure that selling and advertising and merchandising are coordinated. They can be quick and light on their feet, ready to dart in and seize an opportunity; to make friends with a grocer opening a new store, to hire a woman who is a superior demonstrator, to get special displays.

But the smaller canner needs something more to take full advantage of his opportunities:

(1) In addition to good quality and competitive prices, he needs a good label, distinctive and easy to recognize.

(2) Methods for cooperation with chains and big volume supermarkets.

(3) Practical display materials—the kinds of things the stores are glad to use, which make women want to buy his products. Recipes. Pictures of ways to use his product. New ideas. Use suggestions. All of these in good measure, or good quality—all the time—new, different, up-to-date.

(4) A method for getting these materials used, and his goods displayed. It's not enough to wish to win a market. The broker, the canner, or somebody needs to get out into the stores and slug some cases, price the product, stack the merchandise, police the shelves, put up advertising. This kind of work at point of sale multiplies the results from advertising. The smaller canner can do it as well as a big canner, if he will.

Finally, he needs to be everlastingly on the job at every important point of contact, alert to seize every opportunity when the big canner stubs his toe, as he will.

The question is not "can the smaller canner compete?" but "will he?" Usually he will succeed best if he takes one volume-opportunity specialty and concentrates upon it, advertises it, demonstrates it, promotes it, makes it the locomotive to pull his whole train of cars. Just as he doesn't try to envelop the whole United States at once, he doesn't even try to take the whole market at once. He determines where his own strength lies, or his competitors' weaknesses, and bores in. Inexorably! Unremittingly! Everlastingly!

He concentrates on pork and beans, or corn, or asparagus, or peaches—something which can deliver real volume—and tears in. Not for three months, or six months. But for three years, or six years. He establishes a reputation for having good products. His leader begins to pull some of his other products along, but that doesn't fool him. He keeps up the pressure on his leader until he gets into an unassailable position.

How does he finance it? Not out of this one item, probably, but out of his whole business. He may actually spend more on his leader than he makes out of it, but he does so deliberately as a matter of long-range business-building policy. The big canners can't, or don't, match his expenditures on his leader. Maybe they think he's crazy; he's crazy like a fox. He begins to get better shelf displays, stack displays, free advertising tie-ins. All along the line, he gets plus advantages.

I can cite dozens of instances where smaller canners have virtually taken markets away from big canners, where small packers with profitable specialties have outsold and outsmarted big packers. Take Denver as an example! I'll wager that any of the big canners will tell you that Denver is one of the toughest markets they know. Why? Because there is a small, local canner who virtually owns that market. His brand has dominant shelf visibility, not on one or two specialties, but across the board. You almost have to hunt the shelves to find the labels of any of the big canners.

Do you think this is an isolated case? Then let me tell you that a small canner from down-state Illinois began to crowd into the Chicago market with his brand of kidney beans ten years ago. He advertised, and promoted, and merchandised until he got good distribution including some chain distribution. Today he is in the market with three volume items, and giving all of the big canners a run for their money in those lines.

How did he do it? By concentrating very largely on Chicago, working closely with his broker, by keeping at it, and using his imagination, and resourcefulness, and maintaining his personal contacts in the trade. Today he has numbers of other items which he sells but doesn't dare push in the Chicago market because he does not have the production to handle the demand he knows he would get.

Finally, the small canner needs imagination—and courage. He has to take to the stores plans and schemes and methods to get his product before each store's customers. That means coupons, special displays, demonstrations—ways to get women to try his product. He may need tie-ins with related products.

But, given these ingredients of adequate advertising, promotion at point of sale, imagination and alertness, and a large measure of stick-to-itiveness, "a small canner can get retail merchandising visibility" which it challenges the big canner to match.

In any of the 50 or 100 major markets of this country, there is probably enough consumption capacity to take a large part of almost any small canner's entire output and when he wins it, pay him a handsome and permanent profit. And he will own his own business!

## Can the Smaller Canner Afford a Point-of-Sale Investment?

**By Ralph Head,**
**Batten, Barton,**
**Durstine & Osborn, Inc.**

As I thought about this assignment, my thought process went something like this: "Can a smaller canner afford not to have a point-of-sale investment?" Then I thought a while longer and I decided that smaller canners, or anyone else selling merchandise in today's supermarkets, have a very definite point-of-sale investment whether they want it or not, whether they know it or not. At this point I decided the title of my remarks here today should be "Are You Getting the Most Out of Your Point-of-Sale Investment?"

Before talking about point-of-sale, I might point out that point-of-sale is the last step before a product and consumer meet. A number of things should take place before a product reaches the point-of-sale; otherwise it is difficult for a romance or a love affair to develop when product and consumer do finally meet.

Point-of-sale activity can sell a product, but other factors keep it sold and get repeat business. Among factors of importance are quality of product; quality should be as good as, or better than, the quality of competitive products. The use for which a product is designed should also be equal to, or excell, competitive products and, of course, the price structure should permit a product to be sold in competition with similar products.

Good distribution is also important simply because it is difficult, if not impossible, for a consumer to purchase a product which is not easily available and readily assessible.

Another factor that is extremely important before a product and a consumer meet face to face at the point-of-sale is pre-selling through good and proper advertising. Consumers should know about a product, should be told about it before they are forced to make a buying decision at the point-of-sale. We would all much rather meet someone about whom we have heard favorable things, than we would a total stranger. It is difficult for point-of-purchase activity to work successfully unless these background factors are favorable. But when you do have these background factors working positively, then product activation at the point-of-sale can and does work, as many people will verify.

When I said that you have a point-of-sale investment whether you want it or not, I was referring to the label or package in which you pack your merchandise. Labels and packages today actually are point-of-sale pieces because frequently they are the only things that talk to customers in self-service stores on behalf of your product. In an article in *Spot* magazine, Gerald Stahl, a New York industrial designer, had this to say: "Today with sales dependent on point-of-purchase presentations, with competition for the customer's attention so keen, the problem of packaging is no longer an art problem. It is a problem of mass psychology, human motivations and merchandising. It is a problem in public relations and advertising. Most important, it is a problem of sales strategy at the point-of-purchase."

Most major companies have redesigned their labels, some several times in the past ten years or so. How long has it been since you took a long hard look at your labels? And have you consulted with packaging experts on how they might be improved? Bear in mind that consumers frequently buy a label or package the first time they buy a product. Then quality, use and price factors can bring you the second, third and further repeat sales. Actually your label or package is about the only point-of-sale material which you can hope to get into today's supermarkets without help or assistance from some source.

In addition to good labeling and/or packaging, other factors can be made to activate your product at the point-of-purchase. Such things as better shelf position than competitive products, wider shelf frontage, special product displays, display material and any and all things that will get extra attention for a product are important.

Product activation at the point-of-sale is extremely important today because the tremendous growth of self-service grocery operation has now resulted in more than 80 percent of all grocery store sales being made in self-service grocery stores. That means that over 80 percent of the merchandise sold in grocery outlets is selected personally by consumers without the assistance or urging of sales people. Because of pre-selling through advertising, many of these consumers find any one of several brands of like merchandise perfectly acceptable and they frequently buy the one they see first, the one they see the most of, or the one that gets their attention first as they shop in a literal forest of three, four, or five thousand items.

If you have your own sales force, that is the most obvious and logical way of getting your product activated in retail stores. If you do not have a sales force, you must then rely upon your brokers, your media advertising people or, perhaps, direct mail. For this reason you probably select your brokers with care, try to get those with a merchandising force, who can and do make store calls. By the same token you probably select your advertising media with care. More and more of the advertising media, chiefly the radio people, are supplementing straight consumer advertising with store merchandising activity. While you cannot afford to sacrifice good advertising in favor of supplementary work, certainly you should consider taking advantage of this work when two or more media offer equal or almost equal advertising value.

Also, I strongly suggest you take advantage of all help, assistance, ideas and material that may be available to you through your associations —your national organization and any of the specific group organizations to which you may belong. Many have point-of-sale ideas and helps available.

Probably one of the most effective and at the same time inexpensive point-of-sale display pieces is the well-known shelf talker. The Maine sardine industry has been using these with good results. An inexpensive talker can be placed by your own sales organization, if you have one, or by broker and media people. It can also be packed in cases and distributed by direct mail on a less effective basis. You don't have to have elaborate and expensive point-of-sale material. The idea is to activate your product, get people to see it first and most favorably. It can be done with merchandise alone, better labeling, better position and prestige. Add such a simple thing as a talker and the effectiveness of the other factors is multiplied.

In closing, I would like to suggest strongly that you consider advertising and point-of-sale promotion factors a part of your cost the same as you figure your production factors a part of your cost. This may be the one place where the so-called national distributors have an edge over the sectional canner. National advertisers, without exception, budget certain amounts for advertising, merchandising, display material, selling costs, and so on. This is a part of their cost figure the same as is the cost of packages, labels, freight, raw materials and all the other factors that go into the end product. It is public information that last year General Foods advertising ran around 8 percent of their sales dollar. In Maine, the sardine industry has a self-imposed tax of 25 cents for each case of sardines packed, which goes into a fund for advertising and promotion. This runs around 4 percent to 5 percent of their sales dollar and is over and above brokerage fees and other selling costs. I cannot emphasize too strongly that advertising and point-of-sale promotion be included as a part of your budget and be considered as a continuing program.

The smaller canner is in a position to do a much more efficient and thorough job than the big packer, if he plans well and then follows up on his plan with continuity and stick-to-itiveness. Henry H. Heimann of the National Association of Credit Men says: "The truth is, and it has never been adequately publicized, that in most lines, the small, alert and on-its-toes company can run rings around a large company in a competitive battle. It can adjust its operations to a given condition more speedily and with greater facility. Those engaged in evaluating statements day by day, knew it to be a fact. I am speaking of the alert, well-managed company."

## Can the Smaller Canner Talk to the Consumer?

**By Grace White,**
**Food Editor,**
**The Family Circle**

I am a food editor of a monthly chain grocery-store magazine. That is right. For almost 20 years, the world's biggest food business has been my happy proving ground. But today I would like to be sort of a composite food editor and speak for all our friends representing the women's magazines, daily newspapers, radio, TV—for our aims, responsibilities, and problems are the same. We are a vital connecting link between you—the manufacturer with a food product to sell and our readers, listeners, and viewers—your potential customers. We have a real responsibility to these ladies. If you read some of their letters you would see why. We have to keep one step ahead of them in presenting informative, inspirational,

and newsy food copy. That's where we need you—and badly.

So this afternoon, I would like to discuss these three points:

(1) How do we work for our readers?

(2) What can you do to make our job easier and more effective?

(3) What can you do to make Mrs. Consumer like you and buy more of your product?

*First—How do we work for our readers?*—We don't blame you for not having the slightest notion about us. Your business day is filled with problems on growing better crops, weather forecasts, production-line efficiency, sales curves. So unless your womenfolks talk loud enough, probably you are hardly even aware we exist. But we do take our job seriously. We don't sit at our desk or hunch over our typewriter waiting for ideas to pop. We lucky ones spend much time calling on consumers in their homes, observing and talking with them in grocery stores while they're shopping, traveling cross country hunting for new food ideas, broadening our knowledge of regional food patterns, or calling on food manufacturers. We read, read, read trade journals, news stories from food manufacturers and their publicity or association representatives, old cookbooks, new cookbooks—always with the thought of keeping our food copy fresh, up-to-date, correct, and most important—basically helpful.

And right here, I would like to pay tribute to the girls who represent your industry and keep us so well posted on trends, what's new, recipe ideas, and who are always there to answer our questions.

*Second—What can you do to make our job easier and more effective?*—You can be less silent, or better still, more vocal. You may think, "I'm just a little canner doing my best to pack a good product. What can I say that the big fellows haven't already said a lot better?" Well, you can for the simple reason that you are smaller and, therefore, richer in that close personal touch with the area in which you operate. I make a plea right here that you bury your reticence and get to know the girls who write the food columns of your daily newspapers and the ones who talk on your local radio and TV programs. For who can give a better sales story about your own product than you?

Let's take an example. Suppose you are just starting a new pack of a convenience food like stewed tomatoes. Or there's a wonderful harvest of corn so the pack is going to be big—and prices right. That's news. Take time out to write a friendly little note to these girls. Your new stewed tomato pack may be scheduled for very limited distribution, but aren't they the ones who should know about it? At a local level, they can do much, for there's civic pride in local industry as well as healthy consumer interest. In your note to these girls give them a short story of how and why you developed the product and ways to use it. Tell them the sizes of the cans or jars you are putting up, how many servings in each, suggest a generic term, not a brand name, the editor can use to describe your product. That's what the N.C.A. does. But because their job takes in the whole country's canning operations, don't expect N.C.A. to do all the talking. And don't look to your brokers or retailers to spread the good news.

I know food editors of national magazines would like to receive these same news stories—if you can make your mailing list that big. There are only about 50 of us. We may not be able to talk about the product because of its limited distribution, but your story added to others would indicate a trend and keep us aware of all the good work you are doing to improve quality constantly and give Mrs. Consumer what she wants.

But let's get back to these regional editors again. When sending out a news story, you might include a sample of your product and suggest you would be happy for their comments. You'll get some good constructive ones, for these girls share that same civic pride in home industry.

If you have a convenient plant operation, invite the editors to visit and view it firsthand. Or build local industry interest by arranging for school, church, and P.T.A. groups to see how the food is harvested and processed. Never underestimate the youngsters' influence on brand selectivity. Many a proud mother has said, "I always buy Brand A because my daughter visited their plant last fall with her school class." If you have an anniversary coming up or a founder who is about to retire, tell it to your local paper, radio, and TV friends. They want news, and you've got it.

Now, point three:

*What can you do to make Mrs. Consumer like you and buy more of your product?*—You have already made a good start in some of the ways we have just mentioned. Here are some more. Consider your label your personal introduction. How does it stack up? Does it stand out on the shelf alongside other canned foods? Is it clean looking? Does the package tell quickly what's inside? Much research has been done by package design experts on what is the right color or color combinations to catch the eye, how to make the can look larger or smaller, how to make it different from the rest. The experts may disagree on some points, but one rule does stand out. Keep the package clean and simple. Personally (now remember I'm a food editor—not a package designer), when the contents of a can are as photogenic as, say, tomatoes, corn, peas, peaches, I think a wrap-around four-color picture of the product has real stopper appeal. At a glance you know what's inside and subconsciously you begin to think how good it tastes. On the face-front part of the label you really need nothing more than the brand name, a picture of the product, or an appetizing dish made with it and, perhaps, a sell line of its main use or how good it is.

Now let's turn the can around. Here's a spot to really work over for you have so little space for your message. You're proud that your product is scientifically developed and balanced. Say so, but tell it simply, clearly, neatly.

Consider your descriptive labeling carefully. It is a wonderful aid to us in describing your product to your customers. Box it so it can be read easily. Include the size can or jar, the measure it holds in cups as well as ounces (don't expect Mrs. Consumer to be a good mathematician—she isn't). Tell how many pieces of fruit it contains, what kind of syrup, are the contents salted, how many servings—not serves 4, but 4 servings, because you know someone may like it well enough to eat the whole canful. Give simple and complete directions on using the product. Don't take anything for granted. That old plea, "try our way first," has a lot of truth. But if something goes wrong, you can jolly-well bet Mrs. Consumer will think it is your fault, not hers.

If your product has one outstanding use, like canned pumpkin, include a recipe for the best pumpkin pie you know of, or you're encouraging some irate letter-writing. As you know, a satisfied customer feels she can count on getting the recipe for her holiday pie off the can, so she doesn't bother to copy it. If suddenly you get a brainstorm to switch the copy block to Aunt Jenny's favorite pumpkin pudding, Mrs. Consumer won't like it.

This is a big print order with the plus of all the government "musts." But designing a label efficiently isn't a job to take lightheartedly.

You canners are a wonderful credit to America's industrial heart. You have been consistent in your high quality production and your constant research to bring the new built-in convenience items to homemakers. You deserve their loyalty and ours, too.

Do I hear some of you fellows saying, "O.K., but she ought to know my problems." O.K. I don't know, but I've got a few of my own. It's learning about the other fellow's worries that makes us more tolerant and understanding of his cautiousness. Let's hear about them so we food editors will know why and how to spread the message to the ultimate boss of your business, Mrs. Consumer.

# DEVELOPING THE INSTITUTIONAL MARKET

(sponsored jointly by N.C.A. and C.M.I.)

ADDRESS: "Restaurants—A Billion-dollar Market for Canned Foods"—Harold H. Jaeger, Can Manufacturers Institute, New York

PANEL DISCUSSION: "How Canners Can Get a Bigger Slice of the Institutional Market"

DISCUSSION LEADER: Leo Nejelski, Nejelski & Co., Management Consultants, New York

PANEL MEMBERS: George D. Hanby, Cooley's Cupboards, Evanston, Ill.; Beatrice Hughes, Harding's Restaurants, Chicago; Joseph Schensul, Schensul's Cafeteria, Kalamazoo, Mich.; Ora Chidester, John Sexton & Co., Chicago

ADDRESS: "Canned Foods Usage by Restaurants and Cafeterias"—Dr. H. Wayne Bitting, Agricultural Marketing Service, USDA, Washington, D. C.

## Restaurants—A Billion-dollar Market for Canned Foods

**By Harold H. Jaeger,**
**Can Manufacturers Institute**

During 1955, the restaurant industry will buy more than $900 million worth of vegetables and fruits. This is over and above what consumers will buy in retail grocery stores.

Before long, restaurants will pay out over $1 billion for fruits and vegetables. That figure should be attained within the next few years. But even more exciting is the fact that this volume will double before another 20 years pass by.

The restaurant market is a sleeper market. The number of away-from-home eating places has been growing but many canners have looked upon this booming market as second-, third-, or even fourth-rate. My aim is to convince you here today that this is a first-rate and important market for every one of us.

Food tastes and food habits are being changed and shaped by restaurants and public eating places as well as by advertising. The job that restaurants can do was demonstrated by the turkey growers. Remember when the only times you could find turkeys in the retail markets were before Thanksgiving and before Christmas? That was only a few years ago. The growers got restaurants to feature turkey on their menus over longer and longer periods. Today, turkey is not only a staple year-around item in restaurants but every supermarket across the country features turkey every month in the year.

Perhaps I can emphasize the importance of the restaurant market if I tell you that one of every four dollars Americans spend for food is spent for meals consumed away from home. Last year I told some of you that restaurants make up a $15 billion market. During the past year it has increased $1 billion to a present total of $16 billion.

What makes this restaurant market such a dynamic market? Let's look at some facts that illustrate the potential possibilities for canners in this field:

### POPULATION TREND

People are markets. People also make markets.

In 1925, we had a population of 117 million. At the beginning of 1955—30 years later—we have a total of 164 million persons. Within the next 20 years, our Census Bureau tells us, we will add up to 221 million population. Over 100 million more people in 50 years!

But the people of 1955 are working, living and relaxing under different conditions that they did in 1925. Our sciences and technical know-how have made work easier and accomplishments greater. Leisure time has increased. Advertising in newspapers, magazines and billboards, as well as over radio and television have taken to all our people visions of living and comfort standards that even royalty could not enjoy fifty years ago.

You have heard that we are a nation of 164 million people on wheels. If you need proof of this, get up in an airplane and take a look at our highways over any week end.

All of these changes in our way of life have encouraged eating out. More men at work are buying their lunches, rather than carrying them. More women are working. They are also eating out. School lunches are becoming the rule, rather than a rarity.

What will be the attitude toward eating out in 1975? If your imagination needs a jog, take a look at a map showing the networks of thruways to be built over the next several years. In-plant meals are increasing year after year. School lunches will continue to grow if for no other reason than more children are entering school each year.

### INCOMES

The estimated trend of incomes from the present to 1975 is an even more important reason why eating-out is bound to increase. In 1954, the value of all production was $356 billion. The President's Council of Economic Advisers estimates that by 1975 the figure will rise to $625 billion in terms of 1953 dollar values.

More people will have more money to spend. This will be particularly true of skilled labor and professional groups, as well as salesmen and key persons in our distributive industries. In other words, greater and greater numbers of people will find that they have more money left over after paying for their necessities, money that they can spend as they choose.

In years gone by, many of these families would have hired a servant, or moved from an apartment to a house, or to a better apartment, or to a bigger or more modern house. Today, servants are not available. The competition for homes is causing many people to be content for a little longer with what they have.

Under these conditions, relief from housework and cooking is easily found by taking the family to a restaurant. For these people, a restaurant meal is not an occasional celebration but an increasing necessity to their way of living. You also find more and more people who invite guests for dinner and then take them out to dine. In their busy lives, these families have found this method of entertaining a very pleasant relief from ordering food, preparing and serving it, and then cleaning up afterward.

The most vital consideration is that more and more of our people are finding that they have more and more money with which to live this new and less burdensome way.

### ANTICIPATED FOOD MARKET

I have gone into this background in so much detail because I want you to appreciate why this market of $16 billion will exceed $35 billion by 1975. It is bound to grow faster than either population or incomes.

Along with the growth in volume will come proportionate increases in food purchases. Not only will eating away from home more than double in dollar value, but the food purchases

by restaurants and institutions will rise from the present $7.2 billion to approximately $16 billion by 1975.

You can see from this that the restaurant and away-from-home feeding market is one that is not static. It is a growth market. In addition, a potential food market of $16 billion—equal to the total restaurant volume today—is something that should stir the imagination of every canner and food distributor.

It is not a market that will be there merely for the asking. The potentialities of this market are just being recognized and spotlighted. I am pleased to tell you that, through the Can Manufacturers Institute, we are among the very first to recognize the importance of this market. We are also determined to maintain our leadership in this field. But as the importance of the restaurant market is more widely recognized, competition for these billions of food dollars is bound to be stepped up, and we must be prepared to meet it.

### Restaurant Purchases

The restaurant industry will purchase over $900 million worth of fruits and vegetables in 1955. As I mentioned before, this amount will exceed $1 billion within the next few years. Here, then, is a $1 billion fruit and vegetable market in which the canned food industry is competing for business.

How will we fare in 1955? The study made for us by the management counseling firm of Nejelski & Company covered 815 eating establishments of all types across the country. By projecting the purchases of these 815 units into national averages, 46 percent of the fruit and vegetable purchases will go to fresh, or a total purchase order of $414 million; 35 percent or $315 million will go to canned; 19 percent or $171 million will go to frozen.

### Buying Policies and Specifications

Who will initiate the buying policies and specifications on the basis of which the proportion of canned foods can be increased? Although the chef or cook actually prepares the vegetables and fruits, only in 16 percent of the instances does he make the important decision whether these will be canned, fresh or frozen. In 46 percent of the cases, the manager can decide which will be purchased, and in 39 percent, the owner. The head chef or cook initiates buying policies and specifications in 16 percent of the cases, the buyer in 7 percent, the dietitian in 4 percent, and the steward in 3 percent.

Incidentally, a quick glance at the percentages will tell you that they total more than 100 percent. This means that in some operations, more than one person makes the important decisions.

In restaurant chains, hospitals and institutions, the buyer decides what will be purchased. This was true in 7 percent of the units studied.

Dietitians are important in 4 percent of the cases and the steward in 3 percent. The steward is particularly important in hotels and clubs.

Bear in mind that changing a restaurant or hotel to canned foods from fresh or frozen is not a matter of a salesman walking in with an order book and a price. It is a policy decision. And policy decisions are made on the basis of evidence, demonstrations, and convincing arguments that canned foods build consumer satisfaction, more consistently, and even at lower costs.

### Restaurant Problems

What are the most important problems for restaurants? Here are facts taken from a study made for the National Restaurant Association. It is immediately apparent that their most pressing problems are those of personnel and of controlling costs. The problems of hiring, training and holding competent people are most acute in the great mass of medium-sized restaurants, and were mentioned by 67 percent. These restaurants do the greatest proportion of total dollar volume in the industry.

HAROLD H. JAEGER

The problems of controlling costs apply to all eating places, regardless of volume, and were mentioned by 25 percent.

It is significant to us that 92 percent of the restaurant operators mentioned these two problem areas because canned foods can be major factors in helping to handle them. Canned vegetables are fully prepared and require only seasoning and heating—no trimming, peeling, or cutting. The same is true of canned fruits. The other important thing is that canned foods lend themselves perfectly to portion control—and portion control is the basis of cost control. Canned foods also make possible more consistent quality controls than any other form.

### Menu Policies

What menu policies predominate? In 86 percent of the eating units studies, some form of standardized menu is used. Only in 12 percent of the restaurants are full menus offered and many dishes prepared individually.

Here is another clue to the kind of selling job that is ahead of the canning industry. If a product is placed on the menu, it is dislodged only by another one that is proved to be more acceptable to the consumer, more consistent in quality, lower in cost, requiring less labor—or any combinations of these. The superiorities of canned foods in these respects must be pinned down and verified before they can be used in sales presentations to restaurant operators.

What about recipes and printed materials? Practically all of the eating places receiving recipe material save and use it. Seventy-four percent receive recipe and printed material, 71 percent save and file it and 68 percent pass this material around to those persons who can use it. It is significant that 44 percent could actually remember having used specific recipe material within the past six months.

We have seen evidence that recipes sell canned foods off the shelves of supermarkets. Now we find that quantity recipes provide one of the soundest devices for selling canned foods into restaurants and public eating places.

You will be interested to know that the industry relations committee of the Institutional Food Manufacturers of America, in collaboration with the National Restaurant Association, has worked out the basis for the ideal form of quantity recipes. This report will be available soon.

### Information on Canned Foods

How do operators get information on canned foods? We wanted to answer this question in our study because the channels of communication through which restaurant operators now obtain information are important to the future of our business.

Suppliers, wholesalers and their salesmen are relied upon by 55 percent of the restaurant operators for information about canned foods; 22 percent get their information from trade magazines and bulletins; 12 percent said that they use their own judgment and test samples. Government bulletins were referred to by 7 percent; 6 percent buy national brands, and an

additional 6 percent get their information from canners' literature.

The salesmen and representatives who are relied on most are those who not only have information about the canned products they are selling, but who also understand restaurant operators' problems and needs. Canners, who hope to accomplish the most through their representatives and wholesalers, would be well advised to fortify them with as much detailed information about their products and their uses as possible.

I would like to point out that, in the restaurant field, trade magazines have an unusually strong and important following. Most restaurant operators spend a great deal of time on the job and have relatively little opportunity to compare notes with others. Consequently, they rely upon their trade papers for information and ideas to even a greater extent than is true in other fields. However, you should know that canned food advertising appearing in restaurant and hotel trade papers only rarely contains the kind of information and evidence on which restaurant operators can base their decision.

### Purchasing Canned Foods

How do restaurants actually order canned foods? The most important figure gained from the study shows that 27 percent of the restaurant operators order by price, compared with 58 percent who order by grade; 46 percent by brand names; 33 percent by cutting cans; and 29 percent by size of can.

Some operators obviously use several factors in ordering canned foods. However, these figures dramatize the fact that restaurant operators want consistent quality of products above other considerations. Dependable quality is their key to customer satisfaction and repeat business.

How often do restaurants get deliveries? In the number of contacts per week we have a clue to the opportunities for selling fresh and frozen foods against the competition of canned. Seventy-nine percent of the fresh produce is delivered daily; 60 percent of the frozen foods are delivered during contacts made more than once a week. By contrast, 66 percent of the canned foods and dry groceries are delivered once a week, or less.

### How Often Do Restaurants Get Deliveries?

| Frequency of Delivery | Canned | Fresh | Frozen |
|---|---|---|---|
| | | (*percent*) | |
| Daily | 13 | 79 | 32 |
| 2 or 3 times a week | 19 | 17 | 28 |
| Once a week | 41 | 2 | 22 |
| Less than once a week | 25 | .. | 8 |

This is not an all-important point, but is does indicate something of a disadvantage that must be overcome by more skillful selling and follow-up.

With how many suppliers, on the average, do restaurants do business? This is also a relative index of the opportunities that any one supplier has for making sales contacts.

### With How Many Suppliers Do Restaurants Do Business?

| | (*Average number*) |
|---|---|
| Canned Foods and Dry Groceries: | |
| Wholesale or jobber | 2.8 |
| Direct from manufacturer | 1.3 |
| Fresh Produce: | |
| Fresh produce distributor | 1.5 |
| Wholesaler or jobber | 1.2 |
| Frozen Foods: | |
| Frozen foods distributor | 1.3 |
| Wholesaler or jobber | .5 |
| Canned Meats: | |
| Wholesaler or jobber | .5 |
| Direct from manufacturer | .4 |
| Meat supplier | .4 |

The average restaurant operator is contacted by twice as many canned foods and dry grocery wholesalers than for fresh produce, frozen foods and canned meats. To put it another way, there is much more competition among wholesalers for the canned foods and dry groceries business than there is among the suppliers of fresh and frozen foods.

### Comparing Canned and Frozen Foods

How do owners and managers, the important decision-makers in the restaurant industry, compare canned and frozen foods? From a management standpoint, there were eight facts which owners and managers considered important.

The points on which management considers canned foods outstanding are in this order:

Cost of storage,
Purchase price,
Storage needed,
Amount and ease of handling before use.

You will notice that on the other four factors the area of "no preference" goes up very sharply. Yet these are points on which canned fruits and vegetables have a decided edge:

Variety and size of package,
Amount of spoilage,
Avoiding out of stock,
Uniform quality.

These areas of "no preference" present a challenge to the selling abilities of the canning industry. Can you compare the variety and sizes of frozen packs of either fruits or vegetables with the sizes of cans available? In canned foods, spoilage is almost entirely eliminated. Likewise, with the long shelf life of canned foods, there is absolutely no reason why a restaurant operator should ever be out of stock. Finally, quality for quality, there is one outstanding source of uniformity—canned foods.

This is the blueprint of the sales job that needs to be done with restaurant management.

### How Do Canned and Frozen Foods Compare?

#### What Owners and Managers Thought

| | Canned | No Preference | Frozen |
|---|---|---|---|
| | | (*percent*) | |
| Cost of storage | 60 | 25 | 15 |
| Purchase price | 51 | 38 | 11 |
| Storage needed | 45 | 30 | 25 |
| Amount and ease of handling before use | 45 | 30 | 25 |
| Variety and size of package | 39 | 45 | 16 |
| Amount of spoilage | 35 | 51 | 14 |
| Avoiding out of stock | 30 | 55 | 15 |
| Uniform quality | 24 | 52 | 24 |

How do cooks and chefs rate canned and frozen foods?

First of all, in their thinking, they are much more detailed. This is understandable because they are concerned with the processing and serving of foods, as well as with the management aspects. Such factors as speed in preparation, ease of cost control, waste in cooking, flavor and texture, color and appearance, becoming pressing matters of daily operation.

But even more important to us is how sweepingly they favor frozen foods. Only in the first three categories—cost of storage, purchase price and speed in preparation—do they consider canned foods superior.

How deep-rooted their preferences are can be measured by the height of the "no preference" areas. Only in the categories of flavor and texture, color and appearance and ease of package disposal are they sufficiently undecided to be open to conviction.

Canned products have a decided edge over frozen foods in the variety of packages available. However, the facts have not been impressed graphically on the minds of chefs and cooks.

Then consider ease of cost control, labor costs, and ease of portion control. Cooks and chefs prefer frozen foods even though the greater uniformity and greater varieties actually make the control of portions, costs and labor more practical than is true with either fresh or frozen.

The danger of misusing information such as this is in over-simplifying it and then attempting to solve the problem with some panacea. The canning industry has been very negligent in selling the merits and values of canned vegetables and fruits to restaurant owners, managers and chefs. But the biggest sales and promotion job needs to be done with the chefs and cooks. Management can order them to use canned foods but they will do so reluctantly in too many instances. This frame of mind is crying for correction.

## Canned Foods Usage

What percentages of operators are using various packs of canned foods?

### VEGETABLES

Vegetables that cannot be frozen readily are used primarily in the canned or fresh form.

Canned tomatoes were used in 73 percent of the eating places, frozen in less than 1 percent, and fresh in 82 percent.

Beets are another vegetable used primarily in canned or fresh form. The score for canned is 71 percent, fresh 23 percent.

Canned sauerkraut is used in 68 percent of the restaurants and fresh in 7 percent.

Corn represents a category for which the frozen product has gained wide use, with 43 percent of the eating places represented. But canned corn is used by 55 percent and fresh corn in season by 21 percent.

Green beans is another category where the use is divided. Here 54 percent use canned, 37 percent frozen, and 19 percent fresh.

Peas are one product where the use of frozen exceeds canned and fresh. Spinach and lima beans are the other two. Sixty-two percent of the operators use frozen peas, against 48 percent canned and 9 percent fresh. In the case of spinach 43 percent use frozen, compared with 23 percent canned and 27 percent fresh. Lima beans in frozen form have won acceptance with 54 percent of the restaurants, 16 percent canned and 11 percent fresh.

In spite of the popularity of frozen asparagus, 40 percent of restaurants use canned, 32 percent frozen and 17 percent fresh.

It is also interesting to note that in the case of tomatoes, onions, sweet potatoes, carrots, spinach, pumpkin and squash there is a pronounced use of fresh products.

### FRUITS

Canned peaches are used by 79 percent of restaurants, a very high usage. Only 23 percent of operators use frozen peaches, while 18 percent use the fresh fruit.

Applesauce, too, is generally available in the canned form, 73 percent of operators using it. Only 3 percent use frozen applesauce, while only 10 percent make their own.

Practically no one buys frozen pears —only 1 percent of restaurant buyers; 71 percent buy their pears canned, and 11 percent use them fresh.

Fruit cocktail is most popular in the canned form, probably because of the saving it represents in preparation time. One percent use frozen fruit cocktail, while 15 percent make their own.

A relatively large number of restaurateurs buy their own fresh cranberries—31 percent. But still, 57 percent buy them canned, and only 3 percent buy them frozen.

Canned apricots are also popular, being used by 51 percent of institutional buyers. The fresh and frozen products only find markets among 12 percent.

Frozen red cherries, however, take almost the same share of the market, 31 percent, as do canned, 38 percent. Fresh cherries are used very little.

Neither are fresh or frozen purple plums, which together are bought by only 9 percent of buyers; 34 percent buy canned plums.

More restaurants use fresh grapefruit, however, due possibly to the ample supply. Thirty-five percent buy their grapefruit fresh; 30 percent use canned grapefruit; 3 percent get frozen.

While black cherries in general do not see much use in restaurants, the majority of those used—27 percent—come in cans. Canned and frozen products account for 3 percent each.

Fresh pineapple has become slightly more popular than canned—17 percent as opposed to 14 percent; 5 percent of pineapple used is frozen.

Blackberries are the only frozen fruit used more widely than canned products; 18 percent of restaurants buy frozen blackberries, 14 percent buy canned, and 7 percent fresh.

Generally, canned fruits fit better into restaurant use than either fresh or frozen. This is an advantage that can be developed even more than it has been thus far.

### JUICES

Every canned fruit or vegetable juice outsells either frozen or fresh except orange juice. Canned tomato and blended juices are used by almost all eating places. Very few buyers get canned or frozen prune, pineapple, or apple juice.

A few, 16 percent, buy frozen or fresh grapefruit juice, but 74 percent buy it canned.

### MEATS AND FISH

In the case of meats and fish, canned tuna and salmon outsell fresh or frozen by a substantial margin. Practically no one buys anything but canned tuna fish; 23 percent of operators buy frozen or fresh salmon.

There is a close battle between canned ham and fresh ham; 46 percent buy canned ham and 47 percent fresh. The two products tend to be bought for different purposes.

Restaurant owners tend to use more fresh corned beef hash than they do canned—25 percent as opposed to 17 percent—but of course most hash uses canned corn beef.

Luncheon meats are more popular in the fresh than in the canned form—31 percent against 13 percent.

### PIE AND PASTRY FILLINGS

The field of baking offers a real sales opportunity for canners; 54 percent of restaurants bake all their pies and pastries, and 8 percent more bake some of them.

On the other hand, of this 62 percent, only 9 percent buy more than half their fillings in pre-prepared, canned form; 27 percent buy less than half, and 26 percent buy no canned fillings at all. There is an almost untouched market for canned fillings consisting of 53 percent of all restaurants!

### SOUP INGREDIENTS

Soups served in restaurants make a market for canned foods in two forms. Either the restaurant can buy its soups ready-prepared and serve them with a minimum of processing, or it can use canned foods as ingredients in making its own soups.

Sixty-two percent of restaurants cook all their soups, 26 percent either buy them or cook their own, 10 percent buy all their soups.

Of the 36 percent who buy any soups, almost half (19 percent of all restaurants) use a can for each serving. A smaller number, 10 percent of the total, use fully prepared soups in multi-serving cans, while the same proportion use concentrated soups which they dilute.

Considering the market made up of those 88 percent who cook any of their own soups—what canned ingredients do they use?

Canned tomatoes in one form or another are used by most restaurants; tomatoes themselves by 74 percent, puree by 54 percent, and tomato paste by 26 percent.

After tomatoes, most used are mushrooms, carrots, onions and potatoes. Only 5 percent of restaurateurs use no canned soup ingredients at all!

When it comes to stews and meat pies, the great majority of restaurants serve either pies or stews. Two-thirds serve both; 18 percent serve one or the other. This is of interest in two ways: meat-pie fillings and stews can be prepared by the canner, or he can offer the restaurateur ingredients which he will use in turn to make his own stews and fillings. Both fields are good markets for canners.

## Container Sizes

I think one of the most unexpected and startling discoveries of the survey was that restaurants buy canned foods in other sizes, as well as in the No. 10 can that they are usually expected to buy. To be sure, more No. 10's than any other are bought—37 percent of the total number of cans purchased by the restaurants studied. But the balance is taken up by other sizes No. 2½'s (16 percent), No. 303 and Picnic cans (15 percent), No. 5's (14 percent), No. 2's (3 percent), and other sizes (14 percent).

Up to the time of this study, many of us believed that the restaurant and institutional sales could be measured by the No. 10's packed. We found one large restaurant chain that uses No. 5's exclusively. But both large and small eating places use substantial quantities of all can sizes. It is important to all of us to recognize this because by following all sizes through the channels of distribution can we know accurately where our products are finally consumed.

This, then, is a detailed picture of how canned, fresh and frozen foods are bought and used in the restaurant market. This is a growing market, a dynamic market. It is growing steadily. But whether the canned foods industry will make this a $1 billion market depends on how skillfully and how consistently we develop it—how closely we work with restaurant operators to supply their needs and help them solve their problems of quality, portion and cost controls.

## Important Trends in the Restaurant Industry

**By Leo Nejelski,**
**Nejelski & Co., Inc.**

Seven important trends in the restaurant industry should be of interest to all canners.

*Kitchens will become smaller*—Labor costs are still increasing. It is more difficult to recruit and hold competent personnel.

So it is no mystery why more of the food preparation work is being done at outside points, where equipment can be utilized more effectively to reduce costly manual labor. This trend is bound to grow. In the main, people still eat three times a day. This means that at the serving points, two to three peak periods of production and service repeat themselves every day. The immediate solution is being found not in restaurants, but in the plants of their suppliers.

All this means not only a reduction in kitchen space and equipment, but also that the separating walls can be moved back and more space devoted to tables and counters. Sprawling kitchens will be pulled down to compact, motion-reduced working spaces. Henceforth, the planning of kitchens will receive more attention than ever before.

*Cost accounting will become better standardized*—Our company has worked closely, of late, with several food processors. The cost accounting methods and quality controls they utilize have been forced on them by the necessities of keen competition. Any food processor stays in business only because he is skilled in breaking down his expenses. As a result, he can look not only at his total operations, but also at parts of them, and thus reach decisions for improving them one by one.

He also has worked out means of judging the quality of his products at every point where there is a chance of error or failure. This knowledge and these skills are fully as applicable to the restaurant business, but only a handful of operators are using them to the extent that they might.

*Labor-saving equipment will increase*—The ability to pay competitively high wages and make a satisfactory net profit revolves around our methods of increasing man-hour productivity. The only way in which we can pay higher wages and make a better profit is through the use of labor-saving equipment. Through this means, you can enable fewer people to prepare and serve more meals.

Food equipment manufacturers are devoting serious attention to this problem. Much of the equipment now available does not take full advantage of the modern control devices that are becoming standard on the larger items, but steps are being taken almost daily to improve in this respect.

*Look for more self-service*—Personnel will continue to be the major problem of the restaurant business for some time to come. Particularly in locations where people are in a hurry, self-service helps to hold costs down. In many of these competitively priced eating places, the quality of the personnel available at prevailing wage levels argues strongly for making it possible for the customer to serve himself.

*More aggressive advertising will be used*—Nothing sells food better than good display. Many operators have not taken full advantage of this fact. In one case an operator doubled his dessert business by investing in a display cart. Another improved his seafood volume substantially by spotlighting a live lobster tank just inside his entrance.

Menus and descriptions of the dishes offered will become more interesting and detailed. Some restaurants are beginning to harness the tremendous power of the national advertising being done by the big food manufacturers. And more of them are sure to do so in the future.

*More between-meal sales will be developed*—The coffee break awoke many operators to the possibilities of between-meal sales. This added volume helps to absorb part of the overhead.

Special service is adaptable to cities of all sizes. One restaurant near a large industrial area has developed a greater dollar volume in "coffee-and" service to plants than he rings up in its original place of business. Another added a soda fountain and immediately became the meeting place for high school students.

*Take-out volume will grow*—In our interviews with restaurant customers it is interesting to note how many times they express interest in precooked foods to be consumed at home. When prepared in good restaurants, these meals are better and more widely diversified than those that can be obtained in food stores. Household help is expensive, and not even available in some areas. Bringing home a cooked or easily prepared meal means a change and a treat for every member of the family. All types of foods fit here rather than baked goods alone.

In addition to the seven major trends enumerated above, other developments are shaping up all over the country. Increasing population, greater spending capacity, more people traveling, the greater productivity of our industries—all these factors add up to more spendable income and more eating out. But competition in the restaurant business will become keener rather than less. The profits will go to those who operate with skill and who are in full command of every means for lowering costs while maintaining high standards of quality and service.

## Cost and Quality Factors That Are Important in Choosing Foods

**By George D. Hanby,**
**Cooley's Cupboards**

As a restaurant operator, I have thousands of bosses. Of course I am referring to our customers. The volume of our repeat business depends almost completely on satisfied customers. The profits of our business depend almost entirely on how many of these we can develop into steady, repeat customers, plus how many new ones we can attract.

Another secret of success in restaurant operation is how well we can control our food and labor costs. These two items take 75 cents out of every dollar we ring up at the cashier's counter. These two amounts are so big that they have become interchangeable. By that I mean that we can't put more food, or better quality, on the plate unless we can reduce our labor costs accordingly.

I want you to keep these two points—customer satisfaction and cost control—clearly in mind. These are the two best keys I can give you for selling more canned foods to restaurants.

You canners are already in a strong position to increase your share of sales to the restaurant trade. Your products offer both predictable quality to please our guests, and good cost and

quality control, to please our pocketbooks. The reason that we restaurant operators do not use more canned foods is simply that you have not sold us that your quality and controls are fitted to our needs.

With labor costs increasing in our business, just as they are in yours, we have to watch every possible way to make food preparation more efficient. You can help us specifically in several ways. For example, you can make it possible for us to use canned foods not as a raw material that needs flavoring, processing and cooking, but as finished dishes. Then all our cook needs to do is to open the can, heat the contents, and serve it. In addition to processing them, season them also. Work up good combinations of foods. Make it as easy as possible to serve good foods economically.

We should know that canned foods do not need trimming and cleaning. You have already done that for us. Yet I'll bet that very few restaurant operators ever give thought to that particular labor-saving quality of canned foods. They need to be told. If you don't do it, nobody else will.

The size of the cans we use is also important. You seem to have the idea that restaurants only use No. 10 cans. We do use a lot, and we always will. But you should also show us how cans of other sizes enable us to operate more efficiently. For instance, sometimes a guest asks for green peas when they are not on the menu. Should we open a No. 10 can just to serve him, and put the rest of the contents in the refrigerator? Or mightn't we have individual-sized portions on hand for such purposes? Show us also how we can best use No. 2's and No. 2½'s to meet specific needs.

You can help us keep our costs down by showing us how to use the various can sizes. But you can also show us how to fit the quality of canned foods to our needs. For example, there's little excuse for using extra fancy vegetables in a beef stew, but very few operators realize that other grades are as well adapted for these purposes. More and more restaurants also pay attention to the appearance and texture of their products. When they want crispness in a menu item, they may turn to the fresh product, or to the frozen product, because they do not know how to maintain color and texture in preparing a canned product.

Cafeterias, especially, depend for success on eye appeal. Their customers actually see what they are ordering. Canned foods can have just as much eye appeal as any other kind. You know it, and I know it, but restaurant operators are not convinced of it.

The best way you can do that is to improve the appearance of your products still further than you have. Some varieties of green beans have been greatly improved. So have some peas. But much more can be done.

While many restaurant men have discovered some of the advantages of canned foods over others, many persons have no idea which are better. Doesn't that call for a more intensive program of education?

Actually, the reason why, in general, many restaurant buyers think first of fresh foods, then of frozen and last of canned, has little to do with the real qualities of canned foods. The reason is that canners have tended to let the restaurant market develop by default, while fresh foods have had the support of tradition behind them, and frozen foods have stolen a march on you by saying they are next best to fresh.

Actually, it is up to the canners. You have the products and potentialities a restaurant owner needs in order to control quality, control portion, effect ease of handling, and to wind up with attractive appearance and acceptable textures. You already have them, or you can create them. You need primarily to do a better job of selling, promoting and advertising. On top of that, a program of product development fitted to restaurant needs will give you a stronger position than you have ever had before.

## Label Information That Is Most Useful to the Restaurant Operator

**By Beatrice Hughes, Harding's Restaurants**

Just like everyone else in industry, restaurant operators have a difficult time finding qualified personnel. They must either hunt hard and pay high for people who have considerable skill and experience, or they must tailor and control their operations so that they can be conducted by less experienced people. This means that they must rely heavily on their suppliers for help in making food preparation as simple and quick as possible.

Unless food service personnel are told how to use canned foods, they are likely to mistreat them through ignorance. They may overcook and mash foods which have already been cooked. They may prepare them so that they lose their flavor and color.

Clearly, one of the best ways of showing how to treat any canned food is to print the basic information on the label. A label should tell in detail what is in the can, how it can be used to control quality and costs, and what should be done with it to get the most satisfactory result. Let me give a few examples of what restaurant people would like to see on your labels.

*How much is there in the can?*—This doesn't mean just the total net weight of the contents. Food service operators want to know how many two or three ounce portions that weight can be broken down into. They want to determine quickly how many cans to use for a given number of servings. In fruits, they want to know the average number of pieces.

*What is the nature and the quality of the product in the can?*—Let's take asparagus as an example. What is the quality? Is it green asparagus or blanched? Is the asparagus whole stalks, or is it cut? This is especially important with fruits. What is the average number of pieces? Many buyers will want to know where the asparagus was grown and when, because crops from different parts of the country, grown at different times, have differing flavor and texture qualities. In order to prepare a dish of constant quality, the ingredients must be of constant quality.

*How has the product in the can been treated?*—This sort of information is important so that we can tell what remains to be done to it to make it a satisfactory dish—or what we shouldn't do. We should know what seasonings, if any, you have added. Have you already included additions which will save us time and trouble in preparation—onions added to corned beef hash, for example?

*What can be done—or should be done—to the contents?*—Now that we know what has been done, we should know what else is left to be done by us. We should know what we should not do, also; for instance, whether or not the product should be cooked any more, or whether it needs only heating and serving. Here is the logical point at which to discuss recipes.

I don't believe there's a restaurant operator in the country who isn't on the look-out for new recipes to tempt his guests and keep them coming. Who is in a better position to suggest recipes for treating a canned food than the canner himself? His research will be much better than the operator's. Recipes should be detailed and presented step by step. They should tell the number of servings that are produced so that personnel can make up the recipe for 10 or 50 servings, depending on the demand that is expected. The can should carry only recipes that use the entire contents of the can—or multiples; that is, the recipe might say, "The onions in this can will make 50 three-ounce servings of this recipe."

Nothing is more important to a food service operator than the quality of the food he serves, unless it is the cost of preparing and serving it. The

label on each can will do a tremendous job to help restaurateurs serve good meals at controlled costs if you will . . .

Tell him the quality and amount of product in the can,

Tell him what you've done with it, and

Tell him what he can do with it to make an appetizing and attractive finished recipe.

Believe me, he'll be grateful.

## Fruit and Vegetable Specifications That Are Most Important to Restaurants

**By Joseph Schensul,**
**Schensul's Cafeteria**

The restaurant field is the fourth largest retail market in America, yet appallingly little is known about it. We of the Research Committee of the National Restaurant Association have done—and are doing—all we can to develop techniques of restaurant production, service and management.

Time after time, as we study restaurant operations, I have seen areas where the canning industry has allowed its rightful share of our market to go by default. This isn't because there's anything intrinsically wrong with canned foods from our standpoint. It is due in part to the fact that canners have apparently given very little thought to our needs and our problems, or to their opportunities in our market.

You have already heard that three big issues we meet every day are controls, quality and costs. These three factors are really indivisible; what affects one generally affects the others.

Take for instance the kind of vegetable we want—say peas. Cafeteria operators, particularly, are looking for a pea which will stand up on the steam table without going mushy, yet which are just as tender when they come out of the can as when they have been warmed up and kept on the steam table for half an hour. I should think that pea canners could develop strains of peas which would fill these specifications if they put researchers to work seriously on the problem. Seed selection, then, is one opportunity you can develop to help restaurant operators.

In the same area of getting a product to stand up on the steam table, no one has yet figured out the best temperatures at which to hold various canned vegetables. Surely there is a best temperature for holding peas, possibly another for holding corn? We would welcome steam table standards.

Hand in hand with the development of suitable raw materials goes the processing of canned foods. In some cases we use canned foods as final dishes, with a minimum amount of cooking. At other times we use a canned product as an ingredient in a dish we prepare ourselves. It's very clear that onions we want to recook in a stew should have a body and texture different from onions we are simply going to heat and serve.

Speaking of body and texture: is there some way you can repeat your success in making home-style canned peaches which are close to the cooked fresh product? If you were to can pears, apples, or berries which have that fresh-cooked quality, they would be most welcome to us.

Let me take up another area where we would both benefit by research. This area is the standard of product —not just its quality but the evenness of its quality. The more we can rely on consistent standards of weight, color, texture, and so on, the better we can serve our guests and the happier we will be.

To the best of my knowledge, no one really knows what size of can is best for the restaurant owner. Of course, he uses different sizes of the same product for different purposes to cut down on wastage. But, just as he uses No. 10's less often than we had thought, maybe there are certain can sizes which meet our specific needs more perfectly than others.

At the same time, while we are on the subject of quantities, we don't know whether we should prepare vegetables in small batches, the way we prepare frozen foods, or whether we can really maintain quality by making up large batches. If cans for consumer use must be cooked extra-long in order to assure long-shelf life, perhaps you could give vegetables for restaurant use a shorter cook and stamp a date on each can so that it is used within a given time.

I think you would be safe in doing this for restaurant goods because, unlike pantry shelves in the home, our storerooms seldom hide forgotten cans; you may not have to allow for extra-long shelf life in the cans you sell us.

It is only natural that, with labor costs going up, we should seek ways of making our existing labor force more efficient. One obvious method is to use canned foods which need little or no processing by our personnel. I know it's reasonable to expect canners to go out right now and come back tomorrow with a complete Sunday dinner all ready to heat and serve. Actually, I don't think we'd buy it if you did. It would make for a stereotyped product. However, you are in a grand position to help us keep labor costs at a minimum. Some research in this area will be repaid to you many times over.

We restaurant owners are eager to cooperate with you canners in the field of research on products you sell to us. After all, the canned foods we buy are completely prepared and processed. With our labor costs showing no signs of ever getting lower, that is an important advantage you have at the start. It will be an even bigger advantage if you recognize the many differences between household cooking and restaurant meal preparation, and help us to develop and meet specifications that recognize the differences.

## Canner-Wholesaler Relationships That Produce Maximum Institutional Sales

**By Ora Chidester,**
**John Sexton & Co.**

(1) The most effective sales programs to restaurants and institutions grow out of detailed knowledge about the problems and needs of the operators. Up to the present time, the canning industry has been negligent in analyzing these needs. The study by the Can Manufacturers Institute is the first major attempt to determine how canned foods can be sold more effectively to the restaurant industry.

(2) The most successful salesmen for canners, brokers and wholesalers are those who have had direct experience in restaurant operations or are intimately familiar with them. They soon learn to distinguish the individual characteristics of each restaurant or institution. Restaurant operation varies considerably. Knowing the factors that enter into making the decisions in each operation become all important.

(3) The restaurant industry is largely a processing industry. Price per case is not nearly as important as how the product can be used to produce foods that will be attractive, appetizing and profitable. Consequently, the salesman must be familiar with how the product can be utilized.

(4) Restaurant operators want facts. They do not respond favorably to general or emotional arguments. Evidence results either from experience or experiment is vitally important.

(5) Most restaurant operators do not have interest in shopping around. Once they find a reliable source of supply, they remain there loyally.

# The Use of Canned Foods by Restaurants and Cafeterias

By H. Wayne Bitting,
Agricultural Marketing Service,
U. S. Department of Agriculture

I am going to report on a recent study which sheds light on the current position of canned fruits and vegetables in the restaurant and cafeteria market. This study was based upon 480 restaurants and cafeterias reporting their purchases during two 4-week periods in August and November, 1954. This is the first time that any of this information has been made available.

Where is the restaurant market located?

Table I shows the relationship between the total meals sold in restaurants and the population by geographic areas, as indicated by Census data. Region I (New England and Middle Atlantic States) accounts for the largest share of the meals sold in restaurants, even though both regions II and III have larger shares of the total population. This study is based upon a sample of restaurants and cafeterias in regions I, II, and III. These 3 regions account for 83 percent of all meals served in restaurants and cafeterias.

**TABLE I**

**Sales of meals in restaurants and cafeterias and percentage distribution of the population by regions in the United States, 1948**

| Regions | Percentage of total meals [1] | Percentage distribution of population [2] |
|---|---|---|
| | (percent) | (percent) |
| New England and Middle Atlantic (I) | 33.4 | 26.3 |
| East and West North Central (II) | 27.1 | 29.5 |
| South Atlantic, East and West South Central (III) | 22.3 | 31.2 |
| Mountain and Pacific (IV) | 17.2 | 13.0 |
| Total United States | 100.0 | 100.0 |

[1] 1948 Census of Business, Retail Trade. According to this source, the meals sold in restaurants and cafeterias accounted for 80 percent of the total dollar value of all meals sold in public eating places.
[2] Statistical Abstract of the United States, 1953.

Do restaurants use a relatively larger percentage of canned vegetables than are consumed in the over-all market?

For certain canned vegetables, restaurants represent a relatively better market for the canned product than does the over-all market. This is shown by data in Table II. Column 2 in this table shows for each vegetable the percentage of the 1953 crop which was canned. Column 1 in the table shows for each vegetable the proportion of restaurant purchases which were canned. Restaurants in August and November, for example, purchased in canned form 57.8 percent of all the corn they used. The remainder was purchased in the fresh or frozen form. In 1953, restaurant purchases of canned green beans, carrots, and asparagus were much higher proportionately than was the canned portion of total United States production and disappearance. The restaurant use of canned corn and lima beans was approximately the same proportionately as that in the total United States disappearance. The restaurant use of canned spinach and peas was proportionately below the canned portion of United States disappearance in 1953.

H. WAYNE BITTING

**TABLE II**

**Canned vegetable usage as a percentage of restaurant purchases and 1953 production**

| Vegetables | Percentage in canned form [1] Restaurant (avg. Aug. and Nov.) | 1953 production | Civilian disappearance 1953 |
|---|---|---|---|
| | (percent) | (percent) | (percent) |
| Corn | 57.8 | 57.1 | 56.2 |
| Green beans | 62.3 | 37.7 | 35.1 |
| Peas | 54.4 | 67.6 | 68.4 |
| Carrots | 21.9 | 6.2 | 5.1 |
| Spinach | 22.4 | 30.8 | 31.0 |
| Lima beans | 25.9 | 26.3 | 25.5 |
| Asparagus | 64.1 | 42.9 | 46.5 |
| Mixed vegetables | 44.4 | 47.6 | 57.1 |
| Average for 8 vegetables | 47.7 | 46.0 | 45.8 |

[1] Based on fresh weight equivalent.

Do all restaurants use canned fruits and vegetables?

A fairly large number of restaurants do not use some of the major canned fruits and vegetables. In fact, some of the restaurants did not use any of the listed fruits and vegetables in any form (Table III), and others used only one or two.

Peas, green beans, and corn were purchased by more restaurants than any of the other fruits and vegetables.

Canned green beans, peas, corn, asparagus, and peaches were purchased by more restaurants in the canned form than in any other form. This was not true for carrots, spinach, lima beans, mixed vegetables, apples, and cherries.

Were the purchases of canned fruits and vegetables in August and November about the same?

Although it is not shown in Table IV, there was little difference in the over-all quantity of canned fruits and vegetables purchased in August and November. However, there were shifts for certain of the individual commodities. There was a marked increase from August to November in the proportion which canned corn was of total purchases of corn in all forms. Purchases of canned peaches likewise increased sharply, and canned green

**TABLE III**

**Percentage of restaurants purchasing selected fruits and vegetables, August and November 1954**

| Commodity | Percentage of restaurants purchasing: In any form Aug. | In any form Nov. | In canned form Aug. | In canned form Nov. | In other than canned form Aug. | In other than canned form Nov. |
|---|---|---|---|---|---|---|
| | (percent) | (percent) | (percent) | (percent) | (percent) | (percent) |
| Vegetables: | | | | | | |
| Green beans | 70.8 | 70.0 | 47.1 | 51.7 | 34.9 | 31.6 |
| Peas | 68.2 | 76.8 | 50.6 | 55.1 | 31.6 | 33.3 |
| Corn | 65.5 | 61.0 | 39.4 | 46.6 | 41.6 | 22.8 |
| Carrots | 55.1 | 59.7 | 17.3 | 16.5 | 44.1 | 51.1 |
| Spinach | 45.7 | 51.3 | 22.0 | 22.4 | 29.8 | 34.2 |
| Lima beans | 45.5 | 42.6 | 16.5 | 14.3 | 32.9 | 32.3 |
| Mixed vegetables | 14.5 | 16.6 | 5.1 | 6.1 | 9.6 | 9.9 |
| Asparagus | 14.7 | 12.0 | 8.8 | 8.2 | 6.1 | 6.8 |
| Fruits: | | | | | | |
| Apples | 39.0 | 53.6 | 15.7 | 18.6 | 28.6 | 46.4 |
| Peaches | 49.2 | 39.0 | 30.0 | 34.0 | 28.8 | 8.2 |
| Cherries (sour pitted) | 19.4 | 27.0 | 7.1 | 13.1 | 13.5 | 15.2 |

This is a report on one phase of a broad study of the frozen food industry being conducted by USDA. A full report of this phase of the study will be issued in the near future. These data were collected under contract with S-D Surveys, Inc., as authorized by the Agricultural Marketing Act of 1946 (RMA Title II).

beans increased slightly. All the other selected fruits and vegetables showed a decrease in the canned portion in the November purchases. However, the marked increase in the quantities of canned corn, peaches, and green beans used in November was enough to offset decreases in the use of other canned items.

**TABLE IV**

**Relative quantities of selected fruits and vegetables purchased in canned form, by restaurants, August and November 1954**

| Commodity | Percentage purchased in canned form | |
|---|---|---|
| | Aug. | Nov. |
| | (*percent*) | (*percent*) |
| Vegetables: | | |
| Corn | 50.3 | 68.6 |
| Green beans | 60.5 | 64.1 |
| Carrots | 22.1 | 21.6 |
| Peas | 58.2 | 50.4 |
| Spinach | 26.3 | 19.5 |
| Lima beans | 29.1 | 21.4 |
| Asparagus | 66.3 | 61.0 |
| Mixed vegetables | 46.7 | 42.8 |
| Average | 46.4 | 49.3 |
| Fruits: | | |
| Apples | 35.4 | 30.6 |
| Peaches | 19.8 | 77.5 |
| Cherries (sour pitted) | 39.7 | 22.6 |
| Average | 35.4 | 37.0 |

Are there differences among regions in the portion of canned fruits and vegetables used by restaurants?

In region II (East and West North Central) a greater proportion of vegetables were purchased in canned form than was the case in either of the other two regions. Region III (South Atlantic, East and West South Central) used a greater proportion of canned fruits than the other two regions (Table V).

The above generalization is misleading when applied to specific vegetables. Spinach, asparagus, English peas, and mixed vegetables sold in canned forms had their highest proportion of sales in Region III. The predominance of Region II in the sales of canned vegetables was due to only 4 of the 8 vegetables—corn, green beans, carrots, and lima beans.

How does price of the meal affect the use of canned fruits and vegetables?

On the average, a higher proportion of canned fruits and vegetables were used in restaurants serving meals priced below one dollar (table 6). However, in the case of lima beans, corn, and carrots, this relationship was not observed. In fact, canned lima beans had relatively greater sales in restaurants serving higher-priced meals.

**TABLE VI**

**Relative proportion of canned fruits and vegetables purchased by restaurants grouped according to price of meal, average August and November 1954**

| Commodity | Percentage purchased in canned form | |
|---|---|---|
| | Price of meal under $1 | Price of meal $1 or more |
| | (*percent*) | (*percent*) |
| Vegetables: | | |
| Corn | 57.9 | 57.6 |
| Green beans | 71.1 | 54.7 |
| Carrots | 21.6 | 22.0 |
| Peas | 78.1 | 39.0 |
| Spinach | 34.9 | 11.9 |
| Lima beans | 20.1 | 29.9 |
| Mixed vegetables | 69.8 | 29.8 |
| Asparagus | 76.5 | 37.1 |
| Average (8 vegetables) | 53.7 | 42.8 |
| Fruits: | | |
| Apples | 37.5 | 27.5 |
| Peaches | 62.1 | 44.3 |
| Cherries (sour pitted) | 17.4 | 26.2 |
| Average (3 fruits) | 40.1 | 32.5 |

How does size of restaurant affect the use of canned fruits and vegetables?

Use of canned fruits and vegetables was decidedly greater in the smaller restaurants (Table VII). This relationship was consistent for each of the major fruits and vegetables except for canned carrots, which were used in about the same proportion in both sizes of restaurants.

In summarizing these findings, it may be said that variations occur between individual fruits and vegetables, from region to region, and between sizes of restaurants and prices of meals. There is therefore no substitute for knowing the market.

**TABLE VII**

**Relative proportion of canned fruits and vegetables purchased according to size of restaurant, average for August and November 1954**

| Commodity | Size of restaurant [1] | |
|---|---|---|
| | A | B |
| Vegetables: | | |
| Corn | 75.5 | 52.1 |
| Green beans | 70.9 | 59.5 |
| Carrots | 22.8 | 21.4 |
| Peas | 84.1 | 45.8 |
| Spinach | 43.5 | 17.7 |
| Lima beans | 40.5 | 22.9 |
| Asparagus | 76.7 | 61.9 |
| Mixed vegetables | 65.1 | 32.5 |
| Average (8 vegetables) | 62.4 | 43.0 |
| Fruits: | | |
| Apples | 42.9 | 30.9 |
| Peaches | 66.0 | 46.4 |
| Cherries | 49.1 | 15.9 |
| Average (3 fruits) | 52.4 | 32.7 |

[1] Size A includes restaurants with 6–11 employees.
Size B includes restaurants with 12 or more employees.

**TABLE V**

**Relative quantities of selected fruits and vegetables purchased in canned form by restaurants, by regions, average August and November 1954**

| Commodity | Percentage used in canned form | | | |
|---|---|---|---|---|
| | All regions (*percent*) | Region I [1] (*percent*) | Region II [2] (*percent*) | Region III [3] (*percent*) |
| Vegetables: | | | | |
| Corn | 57.8 | 48.5 | 69.8* | 48.1 |
| Green beans | 62.3 | 47.1 | 82.5* | 58.6 |
| Carrots | 21.9 | 17.3 | 35.4* | 11.8 |
| Peas | 54.4 | 41.5 | 61.0 | 75.4* |
| Spinach | 22.4 | 12.5 | 27.2 | 42.6* |
| Lima beans | 25.9 | 18.0 | 39.4* | 22.0 |
| Asparagus | 64.1 | 77.4 | 46.1 | 86.8* |
| Mixed vegetables | 44.4 | 27.7 | 58.0 | 58.5* |
| Average (8 vegetables) | 47.7 | 35.9 | 61.2 | 47.6 |
| Fruits: | | | | |
| Apples | 32.6 | 21.3 | 16.7 | 62.9* |
| Peaches | 51.4 | 38.9 | 59.6 | 60.9* |
| Cherries (sour pitted) | 21.4 | 17.1 | 18.4 | 34.3* |
| Average (3 fruits) | 36.2 | 25.8 | 29.0 | 59.9 |

[1] Region I—New England and Middle Atlantic States.
[2] Region II—East and West North Central States.
[3] Region III—South Atlantic and East and West South Central.
*Region having highest proportion purchased in canned form.

# CANNING PROCEDURES AND PRODUCTS

PRESIDING: Dr. Randall Royce, American Can Company, Maywood, Ill.

ADDRESS: "The Detection and Control of Flat Sour Organisms in Cream Style Corn Canning Equipment"—A. A. Kopetz and E. H. Ruyle, American Can Company, Maywood, Ill.

ADDRESS: "Venting Requirements for Vertical and Horizontal Retorts Using Automatic Loading and Unloading Systems"—D. V. Alstrand and B. W. Blair, American Can Company, Maywood, Ill.

ADDRESS: "Recent Findings in the Sodium Content of Dietetic Canned Foods and Their Significance"—Franklin C. Bing, Nutrition Consultant, Chicago

ADDRESS: "Establishing Sterilization Procedures for Aseptic Canning Units"—C. T. Townsend and C. P. Collier, Western Branch Laboratory, N.C.A., Berkeley, Calif.

## The Detection and Control of Flat Sour Organisms in Cream Style Corn Canning Equipment

By A. A. Kopetz
and E. H. Ruyle,
American Can Company

Experiences with thermophilic spoilage in canned vegetables when subjected to warm storage were quite troublesome to the armed forces during World War II. In order to reduce losses from this cause, mobile laboratories were equipped by the Quartermaster Corps and manned with technical personnel to work with canners in the principal growing regions toward eliminating thermophilic spores from products susceptible to the spoilage. The general procedure in this work was to take bacteriological samples along the canning line for cultural study, and, in addition, to take for thermophilic incubation samples of the finished canned foods ready for warehousing. Since the product in these canned samples had been through all equipment and procedures in the canning line, they were commonly termed "line samples." Freedom from flat sours or thermophilic swells in incubated line samples showed absence of significant thermophilic spores in the product at the time of sampling.

Because of the heating and of the type of handling necessary to prepare it, cream style corn was one of the more difficult products from which to eliminate foci of thermophilic flat sour spores. During the period of Quartermaster Corps testing, this laboratory followed up on the pinpointing and elimination of foci of flat sour contamination in several corn canning lines. Some of the equipment which was causing trouble at that time was:

(1) Pipe lines which could not be readily disassembled for cleaning nor effectively flushed or disinfected because of flanged joints.

(2) Perforated steam distributor pipes on mixers and blenders for direct injection heating of the corn. Vacuum created when the steam was turned off drew corn material up into the pipes and traps. Eliminated by installation of vacuum breakers.

(3) Consistency regulator gate, paddle and side walls.

(4) Filler ports.

A number of disinfecting solutions were tried during the course of this work, and the most satisfactory results were obtained with a 0.2 percent caustic soda (sodium hydroxide) solution. All equipment which could be disassembled was taken apart, cleaned with detergents and allowed to soak in the hot caustic solution. Other equipment was flushed with a detergent solution, then in most cases was filled with the caustic disinfectant.

Many canners have continued to incubate line samples as a check on the effectiveness of their sanitation procedures in keeping thermophilic spores out of their canned vegetable packs. Freedom from susceptibility to flat sour spoilage should high storage temperatures be encountered during distribution will avoid trade and consumer complaints and loss of good will for the canner's brand. Such complaints are more likely to occur with flat sour spoilage as there is no change in the external appearance of the can.

More recently, further work was carried out to find the source of flat sour contamination in a cream style corn line which was resulting in a low but persistent amount of sour cans in incubated line samples. Since this spoilage was found to have developed from a very low incidence of flat sour spores from a previously unsuspected location, and required an unusual bacteriological sampling approach, it may be of interest to describe this study in some detail. The work was carried out over a period of three seasons, with the third year's tests being confined mainly to confirmation of the effectiveness of the clean-up procedures which had been adopted.

### BACTERIOLOGICAL METHODS

In attempting to pinpoint the location of the build-up of spores of the facultative aerobic flat sour organism causing the spoilage mentioned, two procedures were utilized consisting of (1) the culture method, and (2) a can sample method.

*Culture method*—Although the sampling locations involved were not exactly the same during the first and second seasons, the technique and equipment used were as nearly identical as experimentally practicable. Material for bacteriological culture was collected either by direct sampling of the product or by swabbing suspect areas with sterile cotton swabs. The product samples were collected in sterile No. 1 cans and the can recovered with the loose end which had been sterilized with it. Each swab sample was replaced in a stoppered, sterile test tube pending sub-culture. Samples were cultured as soon as possible after they had been taken. If any delay was anticipated, the collected samples were refrigerated until cultured.

Prior to plating, corn samples were diluted with an equal quantity of sterile water, transferred to sterile tubes, and heated for ten minutes at 228° F. to destroy vegetative cells. Both 3 ml and 1 ml quantities of these samples were plated in dextrose-tryptone agar. In addition, the remainder of the heated tube samples were retained. After adding a volume of sterile, double-strength, dextrose-tryptone broth (difco bacto-tryptone 10 gm, difco bacto-dextrose 5 gm, distilled water 500 ml) equal to the volume of the remaining samples, these tubes were incubated at 131° F. with the plated samples. The aerobic plate cultures were incubated two days and the tube samples four days in an incubator sufficiently humid to prevent excessive drying out or evaporation of the media.

The swab and debris samples were collected in sterile tubes containing approximately 15 ml of sterile water,

heated and cultured as described above. Salt-sugar brine samples were also collected in sterile test tubes, heated and plated and tube cultures prepared as in the case of corn samples.

The plates were examined for the presence of characteristic colonies of flat sour producing bacteria. The tubes were examined by pouring a few drops of the contained liquid into the cup depression of a chemical spot test plate and then adding a drop of brom-cresol-purple (BCP) indicator to check for acid production.

*Can sample method*—Small amounts of sample are necessarily employed in tube and plate cultural methods. This fact has been pointed out as a probable factor in limiting the sensitivity and effectiveness of these methods in detecting low incidence flat sour spoilage. To overcome this criticism, the use of larger amounts of sample for culture has been employed in recent years.

In 1950, Johnson and his co-workers (1) reported such a method in which 25 gm and 50 gm of corn were added to 250 ml flasks, diluted with equal quantities of water, heat processed, incubated, and checked for flat sour spoilage.

Murdock and Folinazzo (2) also report the use of larger quantities of sample in a can procedure devised by them. Approximately 65 gm of either corn or peas from each sampling area were added to 202 x 202 cans plus sufficient nutrient media to fill the cans. After closing, heat treating to destroy vegetative organisms, and incubation at 55° C. (131° F.) the cans were tested for flat sour spoilage by the use of BCP indicator.

As early as 1944, Canco bacteriologists employed a can sample method. Quantities of product and can sizes representative of the customer's commercial production were utilized for determining the source of flat sour spore build-up. In many instances where no organisms were found by cultural plate counts, flat sour spoilage developed in can samples collected at the same time and under the same conditions. However, at this time the incidence of contamination was moderately high at several points along the canning line and as a result the superiority of the can sample method was not readily apparent.

The can sample method used consisted of filling previously coded cans with corn from various sampling stations along the cream style canning line. The corn was dipped from the sampling station and transferred to the cans by sterile dippers or sterile No. 10 cans. After filling, the can samples were closed either on the packer's commercial closing machine or a hand actuated, power driven closing machine which had been cleaned and sanitized with a 1 percent quarternary ammonium compound solution prior to and after each sampling period.

After closing, the can samples were given the packer's regular commercial process and water cooled in the retorts. The cans were then stored in a 131° F. incubator for subsequent examination — half of the samples after 4 days and the other half after 14 days' storage. The incubated can samples were examined for acid production as an indication of flat sour spoilage by the direct addition of a drop of BCP indicator to the opened can.

## Experimental Procedure

During the first season's study of the spoilage problem, samples were collected for culturing both by direct sampling of the product and by swabbing suspect areas. Sets of similar samples were taken on six successive days at two periods during the day, the first at the morning start-up time and the second just after the lunch shut-down. The product sampling points included the following:

Corn hopper for cut corn.

Corn slurry taken as it entered the mixer.

Salt-sugar brine.

Batch mixers.

Consistency regulator, taken at scanning plate.

Filler bowls.

Closing machines.

At the time of clean-up, parts of dismantled machinery were swabbed and any dried corn or debris observed on the equipment was sampled.

On the last two days of the pack the can sample method was inaugurated. Cans (303 x 406) were filled with corn collected from several locations along the canning line including the batch mixers, blenders, the consistency regulator, the filler bowl, and the closing machine. These samples were all closed on the packer's closing machine and given the regular commercial process before incubating them at 131° F.

For the second season's work, principal reliance was placed on the can sample method, with the following locations on the cream style corn line being selected for sample collection:

| Sampling Point | Filling Device |
|---|---|
| Disintegrator | Dipper (sterile) |
| Batch mixer tanks | No. 10 can (sterile) |
| Consistency regulator | Dipper (sterile) |
| Top of filler bowl | Dipper (sterile) |
| Filler nozzles | Commercial filler |

The cans in which the samples were placed for incubation were again 303 x 406 size and were all closed on the hand actuated closing machine, except that duplicate samples from the last two points were also closed on the packer's commercial closing machine. After closing, all samples were given the packer's regular commercial process, cooled, and incubated at 131° F. The period of the day which the samples represent is shown in Table III.

Each morning, at the same time canned samples were obtained, material for bacteriological culture was also collected from the same points by direct sampling of the product. In addition, corn samples were collected periodically before and after clean-ups, principally from the fillers. Swabbing of suspect areas was used for cultural examinations of 9 other points along the canning line, as well as 21 locations on or around the filler and closing machine.

During the next season, each of the packer's cream style corn lines was surveyed for any remaining foci of contamination by the can sample method. Samples from each of the following locations were collected in 303x 406 cans:

Batch mixer.

Consistency regulator.

Filler bowl (before passing through the filler).

Filler nozzles (after passing through the filler).

The filled cans were closed on the packer's commercial closing machine and then given the regular commercial process. After processing, the can samples were incubated for four days at 131° F., followed by examination for acid production with BCP indicator.

## Results and Discussion

In the first season's cultural results, product from most sampling points including the raw cut corn showed occasional positive results, but failed to indicate the foci of infection. Seventeen swab and debris samples were cultured and of these, 15 were negative. However, flat sour organisms were isolated on one day from the filler bowl and the cut-off plate in the filler. Salt-sugar brine samples were free of flat sour organisms at each checking. The limited number of can samples used during the first season also did not give any very definite clues.

With the exception of one sampling period in which some flat sours were found in all lots, the sour cans were limited to the regular line samples taken at the closing machine.

The results of the first season's survey indicated the contamination was largely concentrated at some point between the filler bowl and the closing machine on the canning line in question. However, it was considered advisable to continue the work the following season to attempt to locate the exact focus of the infection and insure its eradication. It was also decided that the major emphasis would be placed on incubation of can samples collected at several places along the canning line and

that further detailed examination of the fillers would be included.

Table I summarizes the cultural results obtained from the product sampling during the second season and illustrates the higher proportion of positive results obtained with the tube cultures as compared to the plate method. This is, no doubt, the result of the greater amount of sample which can be cultured in the tube method.

Cultural results from swabbings and debris samples taken on equipment showed that out of 30 different locations tested (tested 1 to 10 times) 25 gave negative results by plate and tube cultures. Table II summarizes the locations that gave positive results and, here again, a higher number of positive cultures were obtained with the tube method.

A higher percentage of positive tube cultures were actually found than sour can samples. This can be explained by the difference in heating or F. value with the commercial process calculated to be equivalent to 6.5 minutes at 250° F. while the tubes received somewhat less than

**TABLE I**

**Comparison of Product Sampling Cultural Results**

**Plate vs. Tube Method**

| Sampling Point | Number Samples | Cultural Results | |
|---|---|---|---|
| | | Plate | Tube |
| | | (*No. Flat Sours*) | |
| Cut corn belt | 19 | 0 | 1 |
| Silker belt | 19 | 2 | 6 |
| Disintegrator | 7 | 0 | 0 |
| Batch mixers | 19 | 0 | 3 |
| Consistency regulator | 19 | 0 | 2 |
| Top of filler bowl | 31 | 1 | 3 |
| Through filler | 38 | 2 | 7 |

**Table II**

**Comparison of Positive Cultural Results from Equipment Swabbings**

**Plate vs. Tube Method**

| Sampling Point | Number Samples | Cultural Results | |
|---|---|---|---|
| | | Plate | Tube |
| | | (*No. Flat Sours*) | |
| Wooden paddle sliver | 2 | 0 | 1 |
| Dried corn—mixers | 2 | 1 | 0 |
| Filler swabs | .. | .. | .. |
| Cut-off plate | 5 | 0 | 2 |
| Cover over filler port ride rail | 2 | 0 | 1 |
| Brass piston guide | 4 | 1 | 4 |

**TABLE III**

**Results of Can Sample Method[1]**

| | | Mixers | | Disintegrator | | Conistency Regulator | | Top of Filler | | Through Filler | | Top of Filler[2] | | Through Filler[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Can Sample | | Can Sample | | Can Sample | | Can Sample | | Can Sample | | Can Sample | | Can Sample | |
| Date | Period (Line 1) | Number Normal | Number Flat Sour | Number Normal | Number Flat Sour | Number Normal | Number Flat Sour | Number Normal | Number Flat Sour | Number Normal | Number Flat Sour | Number Normal | Number Flat Sour | Number Normal | Number Flat Sour |
| Aug. 7 | 1 | 12 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 12 | 0 |
| | 2 | | | | | | | | | | | | | 12 | 0 |
| | 4 | | | | | | | | | | | | | 12 | 0 |
| Aug. 8 | 2 | 12 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 24 | 0 |
| Aug. 9 | 1 | | | | | | | | | | | | | 24 | 0 |
| Aug. 10 | 2 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 12 | 0 |
| | 3 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 12 | 0 |
| Aug. 12 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 24 | 0 |
| | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 11 | 1 | | | 10 | 2 |
| Aug. 13 | 1 | 10 | 0 | | | 12 | 0 | | | | | | | 9 | 3 |
| | 3 | 10 | 0 | | | 12 | 0 | 12 | 0 | 11 | 1 | | | 12 | 0 |
| Aug. 14 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | C | 12 | | | 0 | 12 |
| | 3 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 12 | 0 |
| Aug. 17 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 12 | 0 |
| Aug. 18[3] | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | | | 24 | 0 |
| | 2 | | | | | | | | | | | | | 12 | 0 |
| | 4 | | | | | | | | | | | | | 17 | 2 |
| Aug. 19[3] | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 2 | 9 | 11 | 1 | 3 | 15 |
| | 2 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| Aug. 20 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 2 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| Aug. 21 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 3 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| Aug. 22 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 3 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| Aug. 24 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 10 | 2 | 12 | 0 | 11 | 1 |
| | 3 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| Aug. 25 | 1 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 2 | 10 | 0 | | | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 3 | 10 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| Aug. 26 | 1 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 3 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| Aug. 27 | 1 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 11 | 1 | 12 | 0 | 12 | 0 |
| | 3 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 4 | | | | | | | | | | | | | 12 | 0 |
| Aug. 28 | 1 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 10 | 2 | 12 | 0 | 7 | 5 |
| | 2 | | | | | | | | | | | | | 12 | 0 |
| | 3 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 4 | | | | | | | | | | | | | 12 | 0 |
| Aug. 29 | 1 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 2 | | | | | | | | | | | | | 12 | 0 |
| | 3 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 4 | | | | | | | | | | | | | 12 | 0 |
| Aug. 30 | 1 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 2 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 4 | | | | | | | | | | | | | 12 | 0 |
| Aug. 31 | 1 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 2 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |
| | 3 | 5 | 0 | 5 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 0 |

[1] Data include both 4 and 14 day incubation results with no appreciable difference between them. [2] Cans closed on commercial closing unit. All other samples were closed on a hand operated unit. [3] Sterile cans used; on other days cans not sterilized. Note: Caustic detergent clean-up of the fillers initiated on August 19.

the equivalent of 0.6 minutes at 250° F. Therefore, it seems that some of the plates and tubes which were positive had no practical significance insofar as can spoilage is concerned. The detailed results of can samples taken the second season are contained in Table III and are summarized below.

**TABLE IV**

**Summary—Results of Can Sample Method**

| Sampling Point | No. Cans Incubated | No. Flat Sour Cans | Spoilage Rate C/M |
|---|---|---|---|
| Disintegrater | 70 | 0 | 0 |
| Batch mixer tanks | 319 | 0 | 0 |
| Consistency regulator | 456 | 0 | 0 |
| Top of filler bowl (Canco HO) | 444 | 0 | 0 |
| Top of filler bowl (Comm. C. M.) | 312 | 1 | 3.2 |
| Filler nozzles (Canco HO) | 443 | 28 | 63.2 |
| Filler nozzles (Comm. C. M.) | 649 | 40 | 61.6 |

It will be noted that all can samples collected before the filler bowl gave negative results and, except for one instance, only corn which had gone through the filler bowl showed the presence of flat-sour spores. On this particular day, August 19, it can be seen in Table III that contamination was quite heavy, as evidenced by the number of flat sour cans that were found by the can sample method. This data conclusively incriminated the filler as the focal point of the flat sour contamination. Although no significant difference in the occurrence of flat sour spoilage is evident from the use of commercial or hand operated closing machines, the latter is much simpler to use for the sample preparation work, particularly under the stress of heavy production.

When it became evident that even the most careful and thorough clean-up procedure, as practiced, would not eradicate the focus of flat sour spore infection in the filler, an attempt at clean-up of this equipment with a caustic solution was made. Since the effect of such a solution on the moving parts of the filler was unknown, it was deemed advisable to approach the use of caustic solution quite cautiously. After thorough cleaning and reassembling of the filler, a hot (approximately 190° F.) caustic-detergent solution was applied. This solution was made up of 3 pounds caustic soda plus 3 pounds detergent per 100 gallons of water.

Upon application of the caustic, the inside of the stainless steel filler bowl began to turn brown. This was surprising, since to all appearances the filler bowl had been thoroughly cleaned. In a few minutes, however, a tough, film-like, discontinuous brown layer having the appearance of a baked-on lacquer coating became evident. This was scrubbed and scraped off by means of sharp knives and plastic mesh scouring pads. The filler was then rinsed very thoroughly with water. Subsequent culture of similar material from another one of the same type fillers used for cream style corn in this plant showed the presence of flat sour spores.

From the information gained, it was decided to use the caustic clean-up procedure on all cream style corn fillers after each day's run. This procedure was carried out as follows:

(1) Fillers were rinsed thoroughly with hot water.

(2) Fillers were stripped completely.

(3) Following parts were soaked in a tub in a hot caustic-detergent solution for approximately one hour:

Cut-off plates
Pistons
Filler nozzle ports
Floats
Delivery pipes (extension from filler bowl to shut off valves)

(4) Above parts, as well as filler bowls, piston pockets and filler bowl shut off valves were scrubbed with brushes and plastic mesh pads followed by a high pressure water rinse.

(5) Fillers reassembled.

(6) While the machines were running, hot caustic-detergent solution from the blender tank was run into reassembled fillers.

(7) Fillers were rinsed thoroughly with cold water.

On nights when insufficient time was available for the above clean-up, the following alternate procedure was carried out:

(1) Thorough rinsing of fillers.

(2) Cut-off plates removed and cleansed.

(3) Additional rinsing and scrubbing of interior of filler bowls.

(4) Reassembly of fillers.

(5) With fillers operating, hot caustic-detergent solution from the blender was run into the fillers. This operation required only 3 to 5 minutes.

It is interesting to note that out of 30 can sample periods subsequent to the initiation of the caustic clean-up procedure of the fillers, only three periods gave further flat sour spoilage. These three sampling periods were all at the start of the day's run and included the very first corn off the line. In addition, there had been limited time available for clean-up prior to these particular runs, and the abbreviated caustic clean-up was used. Apparently the abbreviated cleaning procedure would start to loosen the tough, clear layer of baked-on corn material in which flat sour spores were harbored. These spore-carrying fragments were then carried through the filler and canned with the cream style corn in the first runs after the cleaning period.

During the period of observation no adverse effect of the caustic treatment on the stainless steel filler parts was evident.

The effectiveness of the caustic clean-up procedure was demonstrated clearly again in the survey carried out during the third season to check on the results being obtained. No flat sour spoilage was encountered in any of the 576 cans collected by the can sample method.

Experience gained during this investigation has shown that the can sample method can readily be used as a routine control check on the effectiveness of plant sanitation procedures in eliminating thermophilic spores. Also, since no bacteriological media, and little specialized training or equipment is required, the can sample method could be carried out by non-technically trained factory or laboratory personnel.

## Summary

A detailed bacteriological study for foci of infection of flat sour organisms was made on a cream style corn line over a two-year period. The incidence of spoilage in incubated line samples was small but consistent and worrisome. As the usual sub-culture methods failed to detect the foci of infection a can sample method not requiring specialized techniques or equipment was tried. This consisted of filling corn samples from several points along the line into the size can being packed; closing, processing and cooling the can by the commercial procedure; then incubating the can samples at 131° F. As high a percentage of sour cans was found after 4 days as after 14 days of incubation, and it is possible that still less time may be employed. This effective procedure, therefore, requires very little additional incubation time over the usual sub-culture methods.

Examination of the can samples from points along the line after incubation at 131° F. showed that the contamination in this instance was localized in the visually clean filler parts. This source of contamination was eliminated by sanitizing the stainless steel cream style corn filler with caustic-detergent solution. Due to the variation in composition of alloys used for filler parts and other equipment, caution should be exercised in the use of caustic solution for eradicating spores of flat sour bacteria.

## References

(1) Johnson, D. W., Hawley, T. G., and Crocker, C. K., "A tentative test for determination of flat sour contamination in corn and pea canneries," *The Canner, 110:* No. 3: 26, 28, 30, 48, 50. Jan. 7, 1950

(2) Murdock, D. I. and Folinazzo, J. F., "Comparison of bacteriological methods for the detection of flat sour contamination in pea and corn canning plants," *The Canning Trade, 75:* No. 43: 8-10, 22. May 11, 1953

# Venting Requirements for Vertical and Horizontal Retorts Using Automatic Loading and Unloading Systems

By D. V. Alstrand
and B. W. Blair,
American Can Company

The canning industry has long recognized the importance of maintaining careful control over the processing procedures used for the sterilization of canned food products to prevent spoilage losses and to protect the health of those who consume its products. Much work has been done by your Association laboratories, canners' laboratories, and other laboratories associated with the canning industry in the development of, and, wherever possible, the standardization of processing times and temperatures for canned foods.

Processing data have been compiled for a large number of canned foods from heat penetration tests conducted at uniformly maintained temperatures. Thus the application of the processes derived from these data is based on the condition that all cans in each retort load receive the full processing temperature throughout the entire processing time. If for any reason temperature variations occur in the retorts during the processing cycle, variations may result in the quality of the product, in addition to the danger of spoilage losses. Also, a combination of air, moisture and high temperature supply the prime factors conducive to the rusting of steel. Thus, unless the air in the retort is rapidly and adequately removed during the come-up, external rusting of the cans may also result.

It is the purpose of this paper to discuss one of the major factors which has been found to be responsible for non-uniform temperature conditions in canners' retorts. It has been estimated that somewhat over 60 percent of the capacity of a fully loaded upright retort and 70 to 80 percent of the capacity of a horizontal retort is filled with air at the time that the processing steam is first admitted. Obviously this air within the retort contributes no heat to the cans and unless it is removed from the retort during the come-up period temperature variations are certain to exist at different points within the retort.

For practical reasons the retort thermometer bulb and the bulb of the temperature controller are located near the outside of the retort shell or in a pocket on the outside of the retort which opens directly into the retort. Steam admitted into the retort follows the path of least resistance which is the space between the load of cans and the outer shell of the retort at which point the thermometer and controller bulbs are located. Thus the thermometer records the highest temperature in the retort and not necessarily the temperature existing within the load of cans. The rather compact mass of cans offers some resistance to the free passage of steam to an extent depending upon the manner in which they are arranged in the retort. With the so-called conventional method of loading retorts in which the cans are either stacked on end in baskets or on strap iron trays or are jumble packed into the baskets or retort cars, there remains some void spaces and channels through which the steam penetrates the load of cans.

## Removal of Air

In general, the air contained in a retort at the time that it is closed is exhausted through vents located in or near the top or in the bottom of the retort. The location of the vents will vary with different retort installations and will depend upon whether the steam is introduced into the bottom or the top of the retort. Vents are generally described as valve controlled openings in the retort which are usually within the range of 1 to 2 inches in diameter. They should not be confused with the ⅛-inch "bleeds" usually located in the thermometer pocket and in the top of the retort for the purpose of maintaining some steam circulation and to remove the air or other non-condensable gases which may be carried over in the steam supply.

The problem of removing the air from retorts as a means of obtaining uniform processing temperatures has been the subject of considerable experimental effort. Foremost among these studies were the extensive tests conducted by the N.C.A. Western Branch Laboratory(1). This experimental work included a large number of heat distribution tests on cannery retorts of various types and sizes with various methods of loading and included variations in the size, type and arrangement of the vents and the length of venting time. As a result of these tests a schedule of recommended procedures for venting retorts of various types has been drawn up. These recommendations are contained in the introduction to the N.C.A. Bulletin 26-L(2) *Processes for Low-Acid Canned Foods in Metal Containers.* Canners using the conventional methods of loading retorts are urged to consult the recommendations in Bulletin 26-L(2) for guidance in retort operation.

It should be noted here that the recommendations on retort operation contained in Bulletin 26-L(2) were drawn up prior to the time that automatic retort crate loading and unloading systems were introduced into the canning industry. Thus, these procedures may not apply to the changed conditions introduced by new methods of crate loading. In fact, the Bulletin specifically states that the recommended practices do not apply if any dividers are placed between the layers of cans in a manner so as to restrict the flow of steam throughout the load.

## New Systems Introduced

Within the last few years the adoption of automatic methods of loading and unloading canners' retort crates has progressed rapidly. These systems eliminate much of the hand labor required by the older methods and reduce the damage to cans which accompanied these methods of handling. The automatic loading systems with which the work here reported was done, require the use of a divider plate between each tier of cans in the retort basket or car as a means of separating them in the loading and unloading operations. A conventional type of divider plate is constructed of a heavy gauge aluminum plate which is perforated with a series of 1-inch holes on 2-inch centers. The cans are stacked on end as compactly as possible on the divider plates. It is quite obvious that the ends of the cans will cover a large proportion of the holes in the divider plates, a condition which occurs to the greatest extent with the smaller diameter cans. Thus a retort loaded with small diameter cans with a divider sheet between each layer presents virtually a solid block with little open space for the steam to circulate throughout the load.

A number of heat distribution tests conducted by this laboratory at canners' plants have demonstrated that the venting procedures formerly recommended for conventionally loaded retorts are usually not adequate to remove the air pockets from within the retort load when divider plates are used between the layers of cans.

The presence of air pockets and resultant low temperature areas within a retort are readily detected by retort heat distribution tests. In the process of conducting heat distribution tests a number of thermocouple points are located in the void spaces between cans at various places throughout the load of cans. Generally 10 to 20 points are used depending upon the size of the retort under consideration. These thermocouple points are connected to a potentiometer on the outside by means of a series of wires introduced through a stuffing box screwed into a convenient opening in the retort. With the potentiometer the temperature at any one of the 10 to 20 points can be measured at any instant during the retort come-up and processing periods. Thus by taking readings of each point at short time intervals, a time and temperature curve is obtained which will show the exact temperature conditions existing at all points within the retort throughout the retorting cycle.

## More Venting Needed

If these heat distribution tests show air pockets which cause low temper-

ature areas to exist, it is necessary to alter the venting procedures to eliminate these air pockets. This is usually accomplished by venting for a longer period of time and to a higher temperature. In some cases it has been necessary to change the size or location of the vents, the piping included in the venting system or the manner in which the steam is introduced into the retort. In this respect many of the suggestions contained in Bulletin 26-L(2) for venting retorts loaded by the conventional methods will apply, with modification, to retorts loaded by means of the automatic systems.

The tests which this laboratory has conducted on individual canners' retort installations have illustrated some of the factors which affect the removal of air from retorts. When divider plates are used between the tiers of cans it appears to be more difficult to remove air pockets from four-crate vertical retorts than similar three-crate retorts. The dimensions of the can being processed are an important factor. The smaller the size of the container the greater becomes the difficulty of removing the air pockets. This appears reasonable since the smaller diameter cans will pack more compactly into the retort basket or car and thus seal off more of the perforations in the divider plates. In addition, the shorter the height of the can, the greater will be the number of divider plates required. Of the sizes of cans most commonly packed in volume, the 8 ounce or 211x304 can presents the most difficult conditions while No. 10 cans seem to present no problem at all. As an example, in one instance a venting schedule which had proved adequate for 303 size cans, was not satisfactory for 211 x 304 cans and the period of venting had to be markedly increased for the smaller container.

The initial temperature of the product in the cans going into the retort has a considerable effect on the uniformity of heat distribution. The lower the initial temperature, the more difficult it will be to remove the air pockets. A possible explanation for this is that the steam coming in contact with the cold cans near the sides of the retort is condensed before it has a chance to penetrate into the load of cans. As a result longer venting times are required for cans that are filled cold than for those filled at higher temperatures.

The method of introducing the steam into the retort is also a factor in affecting the removal of air pockets from the retorts. For round vertical retorts swirling type steam spreaders have shown an advantage over other types. The steam should preferably be admitted through a by-pass line rather than through the controller, and used during the come-up period at the highest pressure available. In utilizing high pressure steam to improve venting results, adequate safety measures should be enforced. All operators should be instructed to give vigilant attention to each retort so that it will be switched over to the controller either at the end of the venting period or when the processing temperature is reached. Retorts should be equipped with safety valves or devices of adequate size so the pressure rise in the retort will not exceed that for which it was constructed.

### Results of Tests

It may be of interest to review briefly the results of a few of the heat distribution tests conducted on retorts loaded by means of the automatic systems requiring divider plates.

FIGURE I

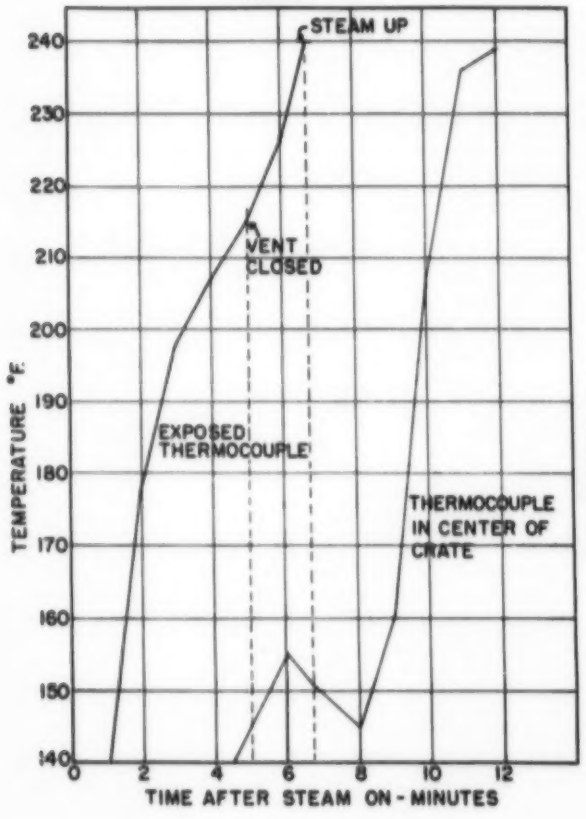
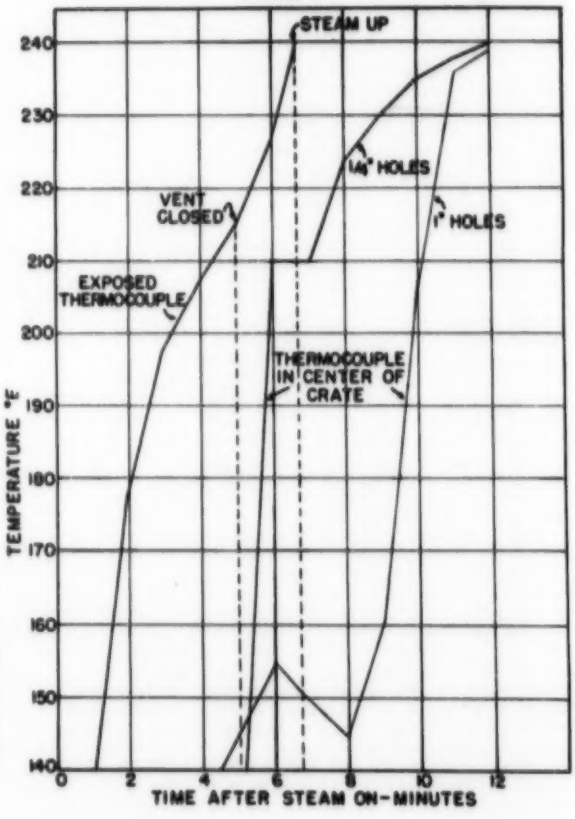



FIGURE II



As a matter of comparison the results will be related to the recommended procedures for similar retorts loaded by hand stacking or jumbling. The venting schedule advocated for conventionally loaded round vertical retorts calls for a minimum venting time of 4 minutes through a 1½-inch gate valve in the overflow line to a temperature of at least 218° F. or 5 minutes to a temperature of at least 215° F. The heat distribution test on one retort installation showed that a four-crate retort loaded with 303 x 406 cans of peas with perforated divider plates between each two tiers of cans required a venting time of 7 to 8 minutes through a 2-inch overflow to a temperature of 240° F. Another four-crate retort installation loaded with 303 x 406 cans of peas using divider plates required venting for a period of 3 minutes through a 2-inch drain to 212° F. plus 5 minutes through a 1½-inch overflow vent and a ¾-inch cover vent to a temperature of 225° F.

For horizontal retorts over 15 feet in length equipped for venting through a 2-inch top water spreader connected to a 2½-inch gate valve, a venting period of at least 5 minutes to a temperature of at least 225° F. or 7 minutes to a temperature of at least 220° F. has been recommended for retorts loaded by conventional methods. In one test a retort of this type loaded with divider plates between the tiers of cans required venting through a 1-inch blow off to 210° F. plus venting through the 2-inch water spreader for 12 minutes to a temperature of 230° F. to obtain uniform temperature conditions. The product in this case was 211 x 304 cans of peas. The venting schedule for 211 x 304 cans of cream style corn was 4 minutes to a temperature of 225° F. through the water spreader plus the 1-inch blow off to a temperature of 210° F. This last example also illustrates the effect of the higher initial temperature of cream style corn as compared to the lower initial temperature of peas on the venting time required to obtain uniform retort temperatures.

In some instances rather unorthodox methods of venting were used to accomplish adequate air removal in a minimum time. These procedures involved bringing in the steam through the bottom or both the top and bottom of the retort and venting through the drain in addition to the overflow. These methods of venting have not been explored extensively but may be worthy of trial if other methods prove ineffective.

The effect of using conventionally loaded retort venting schedules for retorts loaded using divider plates is illustrated by Figure I. In obtaining these particular data, a standard three-crate vertical retort was loaded using 211 x 300 size cans filled with cold water and the layers of cans separated with divider plates having 1-inch holes on 2-inch centers. Thermocouples were located between cans in the center of several layers in each crate. The retort was vented for 5 minutes to 215° F. through a 1½-inch gate valve. As indicated by a thermocouple located near the thermometer pocket, the retort reached processing temperature of 240° F. 6 minutes and 40 seconds after the steam was turned on. One point in the load of cans at that instant was 151° F. and did not reach processing temperature until 5 minutes and 20 seconds later. A similar condition was found when venting through a 1-inch gate valve to 220° F. for 7 minutes, a schedule suggested in Bulletin 26-L(2) for conventionally loaded crates.

The practical significance of the above situation can be illustrated dramatically as follows: If we assume the retort to have been loaded with brine packed green beans for which the suggested process, with a 70° F. initial temperature, is 21 minutes at 240° F., cans at adequately vented areas would have received the full process plus the effective heat of a 6⅓ minute come-up. Containers in the center of the crate near the poorly vented location in effect received only a 16½ minute process plus the effective heat of a 4 minute come-up. The sterilizing value of a 21 minute cook for No. 2 and smaller cans is $F_o = 3.4$. The sterilizing value of a 16 minute process is only 2.0. Such a cook not only may cause spoilage and economic loss but may endanger the health of the consumer.

Heat distribution studies were made using divider sheets having different perforation patterns from 1-inch holes on 2-inch centers down to ¼-inch holes on ½-inch centers. Although some improvement was noted it was not considered sufficient to warrant the use of potentially weaker divider sheets. Figure II illustrates the difference between divider plates having 1-inch holes on 2-inch centers and plates having ¼-inch holes on ½-inch centers. In both cases the crates were loaded with 211 x 300 size cans and the retort was vented for 5 minutes to 215° F. through a 1½-inch gate valve.

Exhaustive tests have not been undertaken so that venting schedules for retorts loaded using divider plates can be given similar to those now shown in Bulletin 26-L(2) for conventionally loaded retorts. It is suggested that canners changing over to this method of retort loading have their venting schedules checked to determine their adequacy.

It is not the intent of this discussion to discourage the use of automatic retort loading and unloading systems, which have demonstrated many advantages, but rather to suggest that the use of these systems may and usually does require some changes in the venting schedules which have been used with conventional loading methods. Experience to date has shown that with some changes in the venting schedule, the air can be removed satisfactorily from any retort that is equipped for venting as recommended in Bulletin 26-L(2).

### References

(1) I. I. Somers, "How To Vent Steam Retorts To Remove the Air Hazards," *Food Industries*, 16, #2, 93, Feb., 1944

(2) *Processes for Low-Acid Canned Foods in Metal Containers*, National Canners Association, Bulletin 26-L, Seventh Edition, 1950

## Recent Data on the Sodium Content of Dietetic Canned Foods and Their Significance

**By Franklin C. Bing,**
**Nutrition Consultant**

The data reported herein were obtained in a study which was planned as a continuation and extension of the work described in the bulletin of the National Canners Association entitled *Dietetic Canned Foods*. In that bulletin, published in 1953, are reported data on the sodium content of over 350 samples of canned foods which represented 19 fruits, 15 vegetables and 7 juices. Those products were made in canneries, with regular equipment, but under the supervision of technical representatives of the industry. The results thus obtained should be viewed as data on experimental, rather than commercial, packs. In contrast, the present data were obtained in a study of the sodium content of commercial products. The samples were collected during 1953 and represented commercial packs made in that year or late in 1952.

This project was planned by the executive committee of the National Canners Association—Can Manufacturers Institute Nutrition Program. The members of this committee were Doctors E. J. Cameron, Chairman, J. Russell Esty (since deceased), E. D. Clark, L. E. Clifcorn, and Randall Royce. My part is simply that of an outside consultant who was provided with the data, asked to study the figures and to offer some comments about them. I have examined the data, I have discussed pertinent features of the study with the active participants therein, and I shall now endeavor to carry out the remainder of my assignment.

What was done may be described readily and in a moment, though the actual performance involved a considerable amount of labor and time. The industry was informed about the study and known canners of dietetic foods were invited to provide samples for analysis, together with data about their production. The canners who

responded and who participated in the project selected a case of each canned food to be submitted for analysis. The samples were selected either directly from the production lines or from the regular stocks of commercial packs of these foods. These cases were shipped to one central laboratory. Here the samples were removed from their packages, and six cans were cut and the contents were examined for quality. Labels were removed from six additional cans, which then were marked by an identifying code number, and sent to an independent laboratory for analysis of their sodium content. One laboratory performed all the analyses. The laboratory selected for this purpose was that of the Wisconsin Alumni Research Foundation, Madison, Wis. There the entire contents of the six cans were pooled, and a composite sample was taken for analysis. The method employed was the flame photometer method of Bills and his collaborators, the method used in the previous study of dietetic canned foods. When results were obtained which appeared to be unusual, duplicate samples were supplied for check analyses. In the few instances where repeat determinations were performed, the results agreed closely with the results of the original analyses.

When the analytical data were obtained, each canner was advised of the results on his own samples.

The results of all the determinations are provided in Tables I, II, III, and IV, on canned fruits, vegetables, juices and fish, respectively. Each figure in these tables represents the sodium content as determined by analysis, and expressed as milligrams of sodium in 100 grams of food. Each figure represents a different commercial product.

## Discussion

*The Nature of the Samples*—Not all of the products analyzed were dietetic foods, though all were packed without the addition of sugar or salt. The simple fact that salt is not knowingly added does not mean necessarily that a canned food is useful for inclusion in low-sodium diets. A product may be naturally unsuited to dietetic use or, in preparation, may be exposed to chance contamination with sodium compounds.

The expression "dietetic foods" has become generally accepted to mean a food which is specially produced for use in therapeutic diets. The expression "dietetic foods" is in reality a convenient way of saying "foods for special dietary purposes." A dietetic food which is sold in interstate commerce is required to be labeled in accordance with the regulations pertaining to foods that purport to be or are represented for special dietary uses. To comply with the federal labeling requirements it is necessary first to have analytical data and other information about each product. Canners of dietetic foods find that it is usually necessary to exercise certain precautions in the selection of raw foods, and in processing methods, in order to control the composition of their dietetic products. When a product is labeled as a dietetic canned food it means that these additional controls over composition have been exercised.

Some of the products submitted by canners in the course of the study now being reported bore no labels. The labels of some of the products showed clearly that they were not being represented for special dietary use. In some instances the data on sodium content revealed that the products, even though not specially made nor labeled as dietetic foods, would have been useful in sodium-restricted diets; in other instances, the data showed

**TABLE I**

**Sodium Content of Commercial Canned Fruits**
**Water-packed or Juice-packed**
**1952-1953 Canning Season**

| Canned Food | Sodium Content (mg Na per 100 gm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Apples | 84.0 | | | | | | | | |
| Applesauce | 0.3 | 0.5 | 0.5 | 1.4 | 4.0 | 5.9 | | | |
| Apricots | 0.4 | 0.7 | 1.4 | 1.7 | 1.7 | 1.9 | | | |
| Blackberries | 0.5 | | | | | | | | |
| Blueberries | 1.0 | | | | | | | | |
| Boysenberries | 0.3 | 0.7 | | | | | | | |
| Cherries, dark sweet | 0.2 | 0.3 | 0.5 | 0.7 | | | | | |
| Cherries, light sweet | 0.2 | 0.5 | 0.6 | 0.9 | 1.5 | 1.7 | | | |
| Cherries, red sour | 0.4 | 0.6 | | | | | | | |
| Figs, Kadota | 1.7 | 1.9 | 2.3 | | | | | | |
| Fruit cocktail | 2.1 | 2.2 | 2.3 | 3.7 | | | | | |
| Fruits for salad | 2.1 | 2.3 | 3.0 | | | | | | |
| Grapefruit sections | 1.8 | 2.8 | 3.6 | 3.7 | 4.5 | | | | |
| Grapes | 2.3 | | | | | | | | |
| Loganberries | 0.9 | | | | | | | | |
| Peaches, cling | 1.3 | 1.7 | 1.9 | 2.5 | 2.9 | 3.1 | 3.9 | | |
| Peaches, freestone | 0.4 | 2.0 | 3.0 | | | | | | |
| Pears, Bartlett | 0.2 | 1.9 | 2.0 | 4.2 | 6.0 | 9.0 | 9.5 | | |
| Pineapple, w.p. | 0.5 | 0.5 | 0.6 | 1.5 | | | | | |
| Pineapple, j.p. | 0.2 | 0.3 | 0.3 | 0.3 | 0.4 | 0.5 | 0.9 | 1.0 | 1.0 |
| Prune plums | 0.2 | 0.5 | 0.5 | 0.7 | | | | | |
| Raspberries, black | 0.5 | | | | | | | | |
| Raspberries, red | 0.5 | 0.8 | | | | | | | |
| Strawberries | 0.6 | 0.9 | | | | | | | |

w.p.—water-packed; j.p.—juice-packed.

**TABLE II**

**Sodium Content of Commercial Canned Vegetables**
**Water-packed**
**1952-1953 Canning Season**

| Canned Food | Sodium Content (mg Na per 100 gm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Asparagus, green | 0.8 | 0.9 | 1.2 | 1.7 | | | | | | | |
| Beans, green | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.6 | 6.5 | | |
| Beans, lima | 1.0 | 1.9 | 9.7 | 10.3 | | | | | | | |
| Beans, wax | 0.4 | 0.4 | 0.7 | 2.9 | 6.1 | | | | | | |
| Beets | 8.4 | 24.6 | 40.0 | 40.4 | 58.6 | 62.5 | 64.0 | 73.2 | 80.0 | 92.5 | 98.0 |
| Carrots | 13.0 | 32.0 | 36.0 | 50.8 | 51.2 | 55.6 | | | | | |
| Corn, white | 1.9 | | | | | | | | | | |
| Corn, white c.s. | 44.0 | | | | | | | | | | |
| Corn, yellow | 0.3 | 0.6 | 0.7 | 0.8 | 2.6 | 3.0 | 3.1 | 3.3 | | | |
| Mushrooms | 1.0 | 1.2 | | | | | | | | | |
| Peas, Alaska | 5.2 | | | | | | | | | | |
| Peas, sweet | 0.4 | 0.7 | 0.8 | 2.3 | 2.4 | 2.4 | 5.3 | 5.8 | 14.4 | 132. | |
| Peas and carrots | 7.2 | 7.5 | 7.7 | | | | | | | | |
| Squash | 0.2 | | | | | | | | | | |
| Spinach | 1.2 | 2.4 | 7.4 | 9.3 | 46.4 | 52.0 | 60.0 | | | | |
| Tomatoes | 3.4 | 8.6 | | | | | | | | | |
| Vegetables, mixed | 12.2 | | | | | | | | | | |

c.s.—cream style.

**TABLE III**

**Sodium Content of Commercial Canned Juices**
**No Sugar or Salt Added**
**1952-1953 Canning Season**

| Canned Food | Sodium Content (mg Na per 100 gm) | | | |
|---|---|---|---|---|
| Carrot juice | 115.0 | | | |
| Cherry juice | 0.7 | | | |
| Tomato juice | 1.7 | 3.6 | 4.8 | |
| Vegetable juice cocktail | 7.3 | | | |

**TABLE IV**

**Sodium Content of Commercial Canned Fish**
**No Salt Added**
**1952-1953 Canning Season**

| Canned Food | Sodium Content (mg Na per 100 gm) | | | |
|---|---|---|---|---|
| Tuna | 22.4 | 30.7 | 36.1 | 70.4 |

that the products would not be suitable for use in sodium-restricted diets.

The principal objective of the canner of dietetic foods which are intended for use in sodium-restricted diets is to reduce the sodium content to a desired minimum. The actual goal to be attained varies somewhat for each food product. It depends, in considerable measure, on the requirements demanded by physicians and dietitians.

The data on the sodium content of canned fruits, Table I, show only one unusually high value. This is the value of 54.0 mg of sodium per 100 grams, found in one brand of canned apples. This value should be compared with the value of raw apples, which is about 1 mg of sodium per 100 grams, the difference undoubtedly being due to a salt water soak prior to canning. The label of this particular canned product showed that it was not intended for special dietary use; it was simply water-packed sliced apples, which were intended for use in the making of apple pie and other apple desserts. The sodium content of this particular sample of canned apples would be of no consequence to the ordinary consumer. We have in this product an example of the fact that a canned water-packed fruit is not necessarily suitable for use in a restricted sodium diet.

Of the two samples of red sour cherries submitted, the data showed that one was about as low in sodium content as the other. One of these samples, however, was in a can holding 1 lb. 4 oz. It was represented on the label simply as a water-packed product, useful in making cherry pie and other cherry desserts. The other sample was in a can holding 8¼ oz.; it was represented as a dietetic canned food. Its sodium content was declared as 0.3 mg per 100 grams, and the analysis showed 0.4 mg; the agreement is excellent for this small quantity of sodium.

All samples of canned Hawaiian pineapple were also found to be uniformly low in sodium, whether packed in water or in juice, and whether sliced, cut into chunks or tidbits, or crushed. None of the labels of the canned pineapple products made any representations for usefulness in sodium-restricted diets.

In general, however, special effort is necessary in order to produce a dietetic canned food that is useful in sodium-restricted diets. Contamination with substances that contribute significant amounts of sodium may occur easily, unless precautions are exercised to avoid the pickup of sodium.

An instance of an unexpectedly high value in a canned vegetable was encountered with a sample of canned sweet peas, Table II. As shown in this table, one sample contained 132 mg of sodium per 100 grams. This value was the average of two different analyses, one of which showed 131 mg and the other 133 mg of sodium per 100 grams. This particular sample was labeled as a dietetic canned food, but it was not represented for use in sodium-restricted diets. The peas had been strained, and the product was intended for use in so-called bland or soft diets and in the feeding of infants. For these purposes, this product undoubtedly was satisfactory, because the sodium content is of significance only in connection with sodium-restricted diets.

Among some of the vegetables there was encountered considerable variation in sodium content of different brands of the same product. In general, the sodium values were higher in vegetables than they were in fruits. This fact would be expected, because data on the natural content of sodium in fruits and in vegetables show that vegetables are higher as a rule in sodium content.

Of the several canned juices listed in Table III, the canned carrot juice was found to be unusually high in sodium. This product was not represented for use in sodium-restricted diets and the label bore no declaration of sodium content.

All four samples of canned tuna were found to be low in sodium, as compared to the conventional canned tuna, with added salt, which has about 800 mg of sodium per 100 grams. Of the four samples analyzed, the one which ran highest bore no label. The remaining three products were labeled as dietetic foods. The sodium content was declared on the labels of two of these brands. Both declarations were of quantities equivalent to 40 mg of sodium per 100 grams; the amounts found in the samples analyzed, were 22.4 and 30.7 mg per 100 grams as shown in the table.

*Further interpretation of the data on the sodium values of dietetic canned foods*—We are thus brought to the question: What is expected of a dietetic canned food, insofar as sodium content is concerned? What is the basis for the assertion that some values are high and others are low?

The answer to the first question, from the canner's point of view, is that the sodium content must be known and declared on the label where the information is available to those who need it. The federal regulations now require that the sodium content be declared in terms of milligrams of sodium in 100 grams of food, and also in terms of milligrams of sodium in an average serving, such as one-half cupful of the food. It is also expected that the actual sodium content be low enough to cause the food to be regarded as useful in low-sodium diets. Each food or group of foods must be considered separately. Muscle meats, like other foods of animal origin, are higher in sodium than are most foods of plant origin. Lean beef, which contains about 70 mg of sodium per 100 grams, may be used in low-sodium diets, whereas a serving of beets, which perhaps contains 35 mg of sodium per 100 grams may, in some sodium-restricted diets, be considered too high and therefore be forbidden to the patient.

In order to determine the significance of data on the sodium content of dietetic canned foods, it is necessary to consider what physicians and dietitians expect of these products in the planning of low-sodium diets. A recent publication of the Food and Nutrition Board, entitled *Sodium-Restricted Diets: The Rationale, Complications, and Practical Aspects of Their Use*, provides a basic plan for such diets. This basic diet plan is also described in Corinne Robinson's article in the *Journal of the American Dietetic Association*, from which some of the actual figures in Table V have been taken. The first column in Table V shows the foods mentioned in this basic diet plan. When these foods are consumed in the quantities expressed in the second column of Table V, they supply 1,715 calories. These foods also supply protein, calcium, iron, vitamin A, thiamin, riboflavin,

**TABLE V**

**Sources of Sodium in a Basic Diet Pattern[1]**

| Food | Quantity | Conventional Products (mg Na) | Dietetic Products I (mg Na) | Dietetic Products II (mg Na) |
|---|---|---|---|---|
| Milk | 2 cups | 244 | 244 | 8 |
| Meats, fish, poultry | 5 oz. (raw wt.) | 104 | 104 | 104 |
| Egg | 1 medium | 70 | 70 | 70 |
| Cereal | ½ cup (20 gm) | 132 | ... | ... |
| Bread | 4 slices | 600 | 30 | 30 |
| Potatoes | 1 medium | 4 | 4 | 4 |
| Butter | 2 tbsp. | 264 | 3 | 3 |
| Vegetables[a] | 2 to 3 servings | 825 | 18 | 18 |
| Fruits[b] | 3 servings | 15 | 6 | 6 |
| Total sodium content | | 2,258 mg | 479 mg | 243 mg |

[a] Of these vegetables, other than potatoes, 1 to 2 servings should be of the so-called green, leafy, or yellow vegetables. [b] Of these fruits, 1 serving should be of citrus fruit.

[1] Adapted from Corinne H. Robinson, J. Am. Diet. Assoc., 31 (Jan.) 28–32 (1955), and the publication of the Food and Nutrition Board, *Sodium-Restricted Diets*.

niacin and ascorbic acid in amounts equal to or greater than those which are recommended as daily dietary allowances of the healthy adult man.

The sodium which these foods would supply depends on the specifications for each of the classes of foods mentioned. Suppose that no salt is used at the table, or in the preparation of the foods for eating, and salted meats and fish are avoided. It is still possible, as the third column in Table V shows, to receive a total of 2,258 mg, or well over 2 grams of sodium. Much of this is contributed by the cereal, such as cornflakes (or an equivalent in sodium content), by ordinary salted bread and butter, and by the vegetables, if they are the conventional-pack canned products.

The fourth column of Table V shows how the sodium content is materially reduced, if additional specifications are established, as they are in the publications referred to. The example represents a typical diet plan to supply 500 mg of sodium. The cereal selected must be from a list of products which are formulated without the use of salt so that the sodium content of one-half cupful, which weighs about 20 grams, dry weight, is negligible. The bread must be made without salt and be low in sodium content. Unsalted butter must be used. The vegetables may be fresh, frozen, or canned, but prepared and packed in such a way as to be low in sodium content; in addition, certain vegetables are specifically excluded, namely carrots, kale, beet greens, beets, celery, spinach and white turnips. The total sodium content of this diet plan, according to the foregoing specifications, is computed to be 479 mg.

It is apparent that in the basic pattern most of the sodium (418 mg out of a total of 479 mg) is contributed by foods of animal origin. Should it be required to formulate a diet having considerably less than 500 mg of sodium, it is necessary to provide additional specifications. These specifications are usually aimed at lowering the sodium that is contributed by the foods of animal origin. The last column of Table V illustrates how the sodium content may be cut in half (from 479 to 243 mg) by substitution of a commercial low-sodium milk preparation for ordinary milk in the basic diet plan.

The fruits and vegetables in the basic dietary pattern which is under discussion supply significant quantities of vitamin A and ascorbic acid to the diet. They also supply appreciable amounts of calcium, iron and thiamin, and contribute to the requirements for other nutrients. Dietetic canned foods, which are suitable for use in low-sodium diets, also provide a valuable form of roughage. Not the least of the attributes of these foods is their psychological value. Canned fruits and vegetables of high quality add color and attractiveness to a meal. Their availability makes it easier for physicians and dietitians to secure the cooperation of patients who are required to follow special diets.

If we consider the sodium content of the basic pattern for a diet containing 500 mg of sodium daily as a guide, then we find, again referring to the data shown in Table V, that the fruits and the vegetables other than potatoes, are computed as supplying only 24 mg of sodium. Eighteen milligrams of sodium are allowed for 2½ servings of vegetables (about 250 grams) and 6 mg of sodium are allowed for 3 servings of fruits (about 300 grams).

The average of the 80 values listed in Table I, for canned fruits other than citrus fruits, is 1.6 mg of sodium per 100 grams. The data on citrus products are limited; the average of the values in Table I for grapefruit segments is 3.3 mg per 100 grams. One serving each of these fruits, non-citrus plus citrus, therefore would provide 6.5 mg of sodium, on the average.

The average of the 51 values in Table II, excluding the two high values for corn and peas, and considering only those vegetables other than beets, carrots and spinach, is 3.0 mg of sodium per 100 grams. Two and one-half servings of these foods, therefore, would supply only 7.5 mg of sodium, on the average.

I think that it may fairly be concluded, from this analysis of the data, that commercial dietetic canned foods can be relied upon for use in sodium-restricted diets. The industry, on the whole, is doing a commendable job of meeting the exacting requirements of the medical and dietetic professions for products that are suitably low in sodium.

### CONSIDERATION OF SOME POSSIBLE INADVERTENT SOURCES OF SODIUM

The previous bulletin on *Dietetic Canned Foods* called attention to several sources of accumulation of sodium by water-packed fruits and vegetables. These sources were:

(1) Sodium naturally present in the water used for canning. The committee expressed the following view: "Water which contains more than 5 milligrams of sodium per 100 grams may well be considered unsuitable for use in the production of canned dietetic foods for use in low-sodium diets.'

(2) Sodium from water that has been softened by the base-exchange method, whereby sodium ions are substituted for calcium ions of the hard water. If the water is initially more than slightly hard, the amount of sodium thus introduced will easily exceed the limit just suggested of 5 milligrams per 100 grams.

(3) Sodium from blanch and flume water used in regular canning operations. Gross pick-up of this kind may result in high values of sodium in canned fruits or vegetables.

(4) Sodium from the lye peeling process used in the preparation of certain fruits and vegetables for canning. The amount of sodium pickup varies of course with the efficiency of subsequent washing in removing the traces of alkali. In general, it may be preferable to substitute the steam peeling process, or possibly to make use of potassium hydroxide instead of sodium hydroxide.

(5) The use of salt solutions in the quality grading of certain products, notably green lima beans and green peas, for canning. Here again the degree of sodium accumulation depends upon the efficiency of removal of the brine in subsequent washings.

(6) Treatment with salt solutions to prevent discoloration of certain fruits, such as peeled apples and pears. The treatment may consist of soaking or spraying of the peeled fruit. In either case, the salt appears to diffuse readily into the fruit from which it is leached out with difficulty.

We have seen from the analysis of the planning of sodium-restricted diets that the requirements placed on fruits and vegetables in such diets are rigid. There is little or no allowance for sodium pickup for fruits. The two servings of fruit in the basic diet plan are considered as providing 6 milligrams of sodium. This might be interpreted to mean that the sodium content of dietetic canned fruits should not exceed 3 milligrams of sodium per 100 grams of fruit. The two and one-half servings of vegetables, other than potatoes, are considered as providing 18 milligrams of sodium. This might be considered to mean that the sodium content of dietetic canned vegetables should not exceed 7 milligrams of sodium per 100 grams.

No suggestion for any arbitrary classification of products is intended by the foregoing comments, which are offered only for purposes of visualizing the problems of production of low-sodium foods.

The figures stated are of course average values, and some leeway no doubt would be permissible except with diets to provide considerably less than 500 milligrams of sodium daily.

Canners should bear in mind that if dietetic canned foods cannot be made sufficiently low in sodium for use in sodium-restricted diets, the alternative is to avoid the products altogether. It is becoming recognized that the latter alternative is sometimes necessary, unfortunately for the patient whose diet thereby becomes more restrictive, because some vegetables appear to pick up sodium during their growth, the fresh product is too high in sodium, and processing does not decrease it sufficiently. This is the situation with respect to root vegetables, such as carrots, beets and white turnips. Celery also appears

capable of increasing its natural sodium content. The same variable and sometimes relatively high values are found in spinach and kale. This subject, as it relates to dietetic canned beets, carrots and spinach will be dealt with further along in the present report.

*Fruits*—Except for the one instance of gross contamination in water-packed apples (not represented for dietetic purposes) there were only four samples out of the products listed in Table I where the sodium content exceeded 5 milligrams of sodium per 100 grams of total contents of the can. One sample of canned applesauce showed 5.9 mg, and three samples of Bartlett pears showed 6.0, 9.0, and 9.5 mg per 100 grams, respectively. Even these relatively higher values would not preclude the occasional use of any of these products in sodium-restricted diets, because the content of sodium in other non-citrus fruits is usually considerably below 3.0 mg per 100 grams.

The data on the sodium content of lye-peeled canned peaches are of interest, because they bear out the previous observation that, in actual practice, the preparatory operation does not unduly increase the sodium content of the fruit. However, the sample of canned freestone peaches which had the lowest value, 0.4 mg per 100 grams, was steam-peeled.

With citrus fruits, the situation is unique. These fruits, because of their high content of ascorbic acid, are placed in a class by themselves in the basic dietary pattern for sodium-restricted diets. The level of sodium in the dietetic canned citrus fruits should probably be not more than 3.0 mg of sodium per 100 grams. Fresh grapefruit and fresh oranges are considered to have not more than 1 mg of sodium per 100 grams. The data in the present study are concerned only with canned grapefruit sections, and are limited in number. It is with canned grapefruit sections that the possibility of sodium contamination is most likely to occur with citrus fruits, when lye solutions are used in the removal of the albedo. Canners of dietetic grapefruit sections, which are intended for use in sodium-restricted diets, no doubt are devoting considerable effort to the avoidance of sodium contamination during the processing of their products.

*Vegetables*—Aside from two instances among the vegetables, one of canned strained peas not represented for use in sodium-restricted diets, and one of canned cream-style corn, and aside from canned beets, carrots and spinach, the vegetable products examined were reasonably free from contamination with sodium. One sample of canned green beans contained 6.5 mg of sodium per 100 grams, which is not high but it is out of line with the results obtained with other samples. The data provided about the processing of this product revealed that water from a base-exchange softening system was used for canning. One sample of green lima beans contained 9.7 mg of sodium per 100 grams. The use of brine solution for quality grading may be suspected in this instance. One sample of wax beans contained 6.1 mg per 100 grams; this product was made with water that had been softened by the base-exchange method. The failure to wash away all residues of salt solution, after quality grading of the raw product, may be suspected in the sample of sweet peas which showed 14.4 mg of sodium per 100 grams.

The data regarding beets, carrots and spinach need special attention, as I have already mentioned.

The recent publication of the Food and Nutrition Board offers as a single best value for the sodium content of raw beets, 80 mg, and of canned beets, 40 mg per 100 grams. The data obtained in the present study show much variation. Attention should be directed to two samples which contained 24.6 and 8.4 mg of sodium per 100 grams, because these values are the lowest reported anywhere for the sodium content of these foods. The canner whose beets showed only 8.4 mg of sodium per 100 grams does not use the lye peeling method, but uses steam peeling instead. In addition, this canner has instructed the growers of the beets used for the dietetic pack not to use applications of salt in the growing of the beets, for the purpose of controlling weeds.

One sample of carrots contained only 13.0 mg of sodium per 100 grams. The canner of this product does not use lye peeling, which may account in part for the low value of sodium found in his product. The publication of the Food and Nutrition Board gives a value for the sodium content of raw carrots of 50 mg, and for canned carrots, of 35 mg per 100 grams.

Wide variation was found in the present study for the sodium content of spinach. Four samples showed a sodium content of 9.3, 7.4, 2.4 and 1.2 mg per 100 grams. Three samples showed a sodium content of 46.4, 52.0 and 60.0 mg per 100 grams. The values listed by the Food and Nutrition Board are 75 mg for raw, 70 mg for frozen, and 50 mg for canned spinach, per 100 grams. Clifford has suggested that spinach may take up sodium when grown on soil which is fertilized with sodium nitrate. That may well be the reason for the wide variations encountered; there does not seem to be any likelihood of unusual contamination with sodium during processing of the samples studied.

These three vegetables, beets, carrots and spinach, can be used in many ordinary and therapeutic diets, to advantage. They would be useful also in sodium-restricted diets, especially spinach and carrots, and beets also, but to a less important extent from the strictly nutritional point of view. If beets and spinach could be consistently produced with a sodium content not greater than, say, 10.0 mg per 100 grams, and if carrots could be consistently produced with a sodium content not greater than about 15.0 mg per 100 grams, these foods could all be used more regularly in sodium-restricted diets. There is an opportunity presented by these facts, I believe, and a challenge to canners of dietetic foods.

## WHAT HAS BEEN ACCOMPLISHED BY THE INDUSTRY

If we consider again the milk; meat, fish or poultry; and egg of the basic diet pattern for the sodium-restricted diet we find that the natural sodium content of these foods, in the quantities recommended, totals 418 mg of sodium. Because the goal is a diet containing 500 mg of sodium, there is a limit to the total sodium content of the remaining foods, which consist of 20 gm of whole grain or enriched cereal (free of added salt), 100 gm of whole grain or enriched bread (without added sodium), 150 gm of potatoes, 30 gm of unsalted butter, and 2½ servings of vegetables and 3 servings of fruit. The sodium supplied by these foods, in the quantities stated, must be not more than 72 mg. This amount of sodium is that which is contained in one-half slice of ordinary bread, or which is contained in about one ounce of ordinary canned salted tomato juice. If one considers only the fruits and the vegetables other than potatoes, the total sodium allowance for these products can not be more than 45 mg in the quantities stated. This is less than the sodium content of 3 oz of ordinary fluid milk, or less than the sodium content of one egg.

In view of the demands placed upon fruits and vegetables in the sodium-restricted diet, and all the possibilities of contamination that exist, beginning with the growing of the crops, the wonder is that practical success ever was obtained in commercial operations. Success, however, has been obtained, and I like to think that we can in part attribute these accomplishments to the guidance of the research committee of the N.C.A.-C.M.I. nutrition program, and to the contributions of individual technologists in the canning industry. The industry has had also encouraging support from several scientific organizations. Among these organizations are the Council on Foods and Nutrition of the American Medical Association, the American Dietetic Association, the Food and Nutrition Board, and the Food and Drug Administration.

Clifford in his paper on "Sodium Content of Foods," presented before the American Dietetic Association, has spoken of the "valuable contribution" which manufacturers of low-sodium foods have made in the inter-

ests of public health. We can concur in the view that the food industry deserves considerable credit for its accomplishments, no branch of the industry in my opinion, quite matching the achievements of the canners in making low-sodium foods.

The labeling of foods of low-sodium and of low-carbohydrate content has been discussed in an excellent paper by E. M. Nelson. It is not our purpose to discuss labeling of the products covered in the present study. The labels have been examined, but they represent the labels used two years ago. New requirements have been written, and we know that manufacturers have revised the labels, where necessary, for their dietetic canned foods. Our survey did not cover all the dietetic canned fruits and vegetables of the canning industry, for a number of manufacturers did not submit samples for analysis. We know that some individual canners have established elaborate laboratory control of their products, with the use of a flame photometer for sodium determination, and others have taken steps to have their products analyzed by outside laboratories. The industry as a whole is producing better products now, which are less likely to be contaminated with traces of sodium, than were being produced two years ago. The products then made were satisfactory, as judged by the results of the present survey. The improvements that are being made constantly, however, afford greater assurance that all dietetic canned foods, which are represented for use in sodium-restricted diets, and are informatively labeled, may be used with confidence in the diets of patients whose intake of sodium must be restricted.

### Summary

The results of the present study, which was planned by the executive committee of the N.C.A.-C.M.I Nutrition Program, and the analysis for which have been made by the Wisconsin Alumni Research Foundation warrant the drawing of a number of conclusions.

(1) Canned water-packed or, in the case of some fruits, juice-packed, fruits and vegetables can be depended upon as suitably low in sodium for use in sodium-restricted diets, if the labeling indicates that the products are dietetic foods, and the sodium content is declared in terms of milligrams of sodium per 100 grams of food, and per serving.

(2) Continued control to avoid the pickup of sodium in processing is necessary. It may be emphasized again that attention should be directed primarily to the following likely sources of contamination:

(a) Sodium from salt in blanch and flume water, as a result of insufficient flushing following the packing of conventional-pack vegetables.

(b) Sodium from water which contains more than 5 mg of sodium per 100 grams, either naturally or as the result of base-exchange methods of softening.

(c) Sodium from lye solutions used in the peeling of certain fruits and vegetables, which subsequently is not quantitatively removed.

(d) Sodium from salt solutions used in the quality grading of green peas and lima beans, which is not thoroughly removed afterwards.

(e) Sodium from salt solutions used either as an immersion bath or as a spray, to prevent discoloration of peeled apples and pears, which is not completely removed in further processing.

(3) The possibility of sodium pickup during growing of certain root crops, and green, leafy vegetables, such as beets, carrots and spinach, needs further study, in order to develop practical methods of producing these vegetables with low-sodium contents. There are indications that this goal can be accomplished.

(4) As the canning industry continues its progress in the production of dietetic canned foods, suitable for use in sodium-restricted diets, physicians may prescribe the products and dietitians and consumers may use these foods with ever increasing confidence.

### References

(1) *Dietetic Canned Foods. Fruits and Vegetables: Sodium and Proximate Composition*, Bulletin of the National Canners Association, Washington, D. C., 1953, 62 pages

(2) *Sodium-Restricted Diets. The Rationale, Complications, and Practical Aspects of Their Use*, Report of the Food and Nutrition Board, National Research Council Publication 325, Washington, D. C., 1954, 71 pages

(3) Clifford, P. A., "Sodium Content of Foods," *J. Am. Dietetic Assoc.*, 31: 21-27 (Jan.) 1955

(4) Robinson, Corinne H., "Planning the Sodium-Restricted Diet," *J. Am. Dietetic Assoc.*, 31: 28-32 (Jan.) 1955

(5) Nelson, E. M., "Labeling Foods of Low Sodium and Low Carbohydrate Content," *J. Am. Dietetic Assoc.*, 31: 33-36 (Jan.) 1955

## Establishing Sterilization Procedures for Aseptic Canning Units

**By Charles T. Townsend and Charles P. Collier, Western Branch Laboratory, National Canners Association**

In its essentials, aseptic canning involves sterilizing the product in some form of heat exchanger and conveying it through a presterilized cooling system to equipment where it is filled aseptically into sterile containers which are closed with sterile lids under aseptic conditions. Up to the present time manufacturers have concentrated their efforts on the design and construction of aseptic container sterilizing, filling and closing mechanisms, and have adapted existing heat exchangers for product sterilization.

The first to develop an aseptic canning line which reached the pilot plant stage was Ball (Ball, C. O. U. S. Patent 2,029,303, Feb. 4, 1936). His HCF (Heat-Cool-Fill) machine maintained aseptic conditions by means of steam under pressure, which required a closed unit of heavy construction.

A commercially successful procedure for the aseptic canning of cream in glass and tin containers has been worked out by the Avoset Company of California, and has been used by them with various modifications and improvements for about 15 years.

The equipment in widest use at the present time was developed by Martin (Martin, W. McK. U.S. Patent 2,549,216, April 17, 1951), the first of whose machines to be applied to the commercial production of foods in metal containers was in 1951. In the Martin system, cans and covers are sterilized in superheated steam or other hot gas. Sterilized and cooled product is received from the heat exchanger and filled into sterilized cans in an atmosphere of superheated steam or other hot gas and the cans are closed with sterile lids under the same conditions. The equipment is operated at atmospheric pressure with sufficient outflow of hot gas to prevent airborne contamination. The James Dole Engineering Company now has under construction a pilot plant unit for aseptic canning in glass.

This paper deals with the procedures worked out by the National Canners Association in cooperation with the James Dole Engineering Company for determining sterilizing requirements for the equipment, the product, the containers and the covers, and the operating temperatures necessary to maintain aseptic conditions in the equipment. It is believed that these testing methods could also be applied to other aseptic canning systems.

### Test Organisms

Bacteria resistant to both moist heat and dry heat must be selected for checking sterilization of product, equipment, containers and covers. Spores of the following organisms have been particularly useful in this work:

For determining product sterilization requirements (moist heat):

PA 3679 and FS 1518 *(Bacillus stearothermophilus)* (a putrefactive anerobe and a flat sour organism, respectively).

For determining sterilization requirements for containers and covers, as well as equipment in which these are sterilized; also for checking the

filling chamber and closing machine (dry heat):

FS 1518 *(B. stearothermophilus)* and *Bacillus polymyxa*.

The strain of *B. polymyxa* used was isolated from spoilage which occurred as a result of understerilization of containers. Its spores are about as resistant to dry heat as are those of FS 1518, but have very little resistance to moist heat. FS 1518 spores are highly resistant to both moist and dry heat. As compared to FS 1518, spores of PA 3679 are only moderately resistant to moist heat and to dry heat. In Table I are examples of comparative resistances:

### Numbers of Spores and Inoculation Procedure

The product is batch inoculated to give approximately 10,000 spores of PA 3679 or FS 1518 per can. Containers and covers are inoculated with 0.2 ml. of water-washed suspension containing 20,000 spores of FS 1518, or 1,000,000 spores of *B. polymyxa*, and are thoroughly dried before use. For cans, the suspension is placed on the bottom, and the cans are rotated at an angle so that the suspension is distributed largely in the depression at the junction of the body and bottom of the can. Covers are inoculated by placing about 0.1 ml. on the compound in the curl and the other 0.1 ml. on a diameter across the lid.

Glass jars are inoculated with the same amount of suspension inside the shoulder with the jar on side. Each jar is then tilted and rotated while the suspension runs down the side to the bottom. Caps are inoculated with 0.2 ml. of suspension on the metal next to the gasket, and the caps are rotated at an angle to permit the suspension to wet as much of the cap at the junction of the gasket as possible.

### Thermal Death Times

For each experimental pack the resistance to heat of the spores used should be determined, in phosphate buffer (pH 7.0) and in product if product sterilization is under consideration. The procedure for determination of resistance to dry heat is at present too tedious for ordinary use. Spores should be washed before testing to conform to experimental pack conditions. For testing thermal death times in a product, aseptically canned product may be used, since it undergoes little change on sterilization.

### Test Medium

In testing the sterilization of cans and covers and of the product line, it is necessary to use a readily obtainable and relatively inexpensive canning medium. Skim milk containing 1.3 ounce corn sirup per gallon has been found to be very satisfactory. Growth of FS 1518 results in curdling, while both PA 3679 and *B. polymyxa* produce gas in the medium with consequent swelling of the cans. In glass containers spoilage can readily be detected without removing the caps by changes in the appearance of the milk, but in the case of cans, spoilage by FS 1518 can be determined only by opening each can at the end of the incubation period and examining the contents for clotting.

### Incubation

Incubation temperatures and times used for the various organisms are as follows:

| | |
|---|---|
| FS 1518 | 122° to 131°F. for 3 weeks |
| *B. polymyxa* | 95° to 110°F. for 3 to 4 weeks |
| PA 3679 | 80° to 90°F. for 2 to 3 months |

In inoculated container tests, the containers should be stored in such a position that the medium is in contact with the inoculated part. It is helpful to shake the containers every few days.

### Equipment Sterilization

Before any containers or product are put through the line it is necessary to sterilize all parts of the equipment to be maintained under aseptic conditions during operation. The following are procedures used in establishing the necessary times and temperatures for various parts of the line.

*Heat exchangers*—Three types of heat exchangers have been studied: tubular, Votator, and steam injection. With this equipment the initial sterilization is principally for the benefit of the cooling section and the product line to the filler. Sterility is checked by running through sufficient uninoculated product (such as the skim milk or other suitable medium) to fill about 200 cans. The product should be processed to an F° value of 50 to 100 so that there is no question of its sterility, and it should be filled and closed under aseptic conditions into containers given sufficient heat that they are known to be sterile. Any spoilage would indicate that the cooling section of the heat exchanger had not been properly sterilized. In all experiments the possibility of spoilage due to defective can seams must not be overlooked.

*Cooling after steam injection*—The question arose as to the necessity for having sterile condenser water for the flash cooling unit of the steam injection system for product sterilization because of possible aspiration of water into the product. A large kettle was filled with water inoculated with 710,000 yeast cells per ml. The water was pumped to the condenser during a period of operation, but no yeast spoilage occurred in product canned during this time. It was concluded, therefore, that it was not necessary for the condenser water to be sterile.

*Can and cover sterilizers, filling chamber and closing machine*—Early work on checking sterilization of this equipment was by spraying spore suspensions of FS 1518 and PA 3679 over the inside surfaces and allowing them to dry before the sterilization cycle. Product was then canned through the unit and the cans were incubated to determine if spoilage would occur. A much more positive procedure has now been developed and has proved highly effective. Half-inch discs are punched out of tin plate and are inoculated with 0.1 ml. of a water-washed suspension containing 20,000 spores of FS 1518 or 1,000,000 spores of *B. polymyxa*. They are allowed to dry, and then bent sufficiently to slip easily into standard ⅝ x 6-inch test tubes. Discs inoculated with the two organisms are distributed throughout each unit to be tested. It may be necessary to use 100 or more discs for a test, because all significant positions must be checked. The sterilization cycle is then completed, the equipment is cooled down, and the discs are transferred in as aseptic a manner as possible to tubes of glucose-tryptone broth. These are incubated at the appropriate temperatures. Sufficient tests should be made to insure a sterilization cycle which will provide an ample safety factor for each part of the equipment. Present indications are that, when superheated steam is used, all parts of the equipment should receive the equivalent of one minute at 350°F. minimum. Temperature readings by means of thermocouples placed at significant points should be taken throughout the tests.

### Container and Cover Sterilization

In making a test, the equipment should be operated at the maximum speed likely to be encountered under commercial conditions. Five temperatures should be selected for container sterilization and five for cover sterilization, such that spoilage will occur in the two or three lots given the least amount of heat, and no spoil-

**TABLE I**

| Organism[1] | Resistance to Moist Heat[2] (spores suspended in phosphate buffer) | | Resistance to Dry Heat[2] (superheated steam) | | |
|---|---|---|---|---|---|
| | $F_{250}$ | z | $F_{250}$ | $F_{250}$ | z |
| *B. polymyxa* | 0.005 | 14.0 | 0.67 | 3.8 | 26.5 |
| FS 1518 (B. stearothermophilus) | 9.6 | 18.2 | 0.7 | 4.5 | 25.0 |
| No. 3679 (putrefactive anaerobe) | 2.0 | 13.6 | 0.46 | 1.0 | 60.0 |

[1] All spore suspensions were water washed before use. [2] For 100,000 spores.

age in the two or three lots given the most heat. Inoculated containers should be closed with covers known to be sterile, and inoculated covers should be placed on containers known to be sterile. Several control lots should be included with uninoculated containers and covers. All containers should be filled with product processed to an F° value of 50 to 100.

After the equipment has been sterilized in preparation for a test several hundred uninoculated containers and covers should be run through the line and filled with sterile water from the heat exchanger, in order to dissipate the excess heat remaining from the sterilization and to achieve the desired operating temperature. The temperature of the equipment always rises when containers and covers are not passing through, and it is therefore desirable if possible to run continuously once the test has begun, even though this means some loss of containers and product during the temperature adjustments necessary between lots. Each series should be started at the highest temperature selected, because it is easier to adjust the temperature downward than upward.

For each temperature variable, at least 100 containers or covers should be used both with FS 1518 and *B. polymyxa*. If there is only one test organism, 200 containers or covers should be used.

In order to simplify the experiment, the same containers and covers can be inoculated with both FS 1518 and *B. polymyxa*. After the 200 containers per lot have been run through the equipment, half can be incubated at 122°-131°F. and the other half at 95°-110°F.

### Final Testing

After decisions have been made as to the necessary conditions for equipment, product, container and cover sterilization, a final check should be made by canning from 2,000 to 5,000 containers of product on each of several days. These should be held in a warm room, or preferably in an incubator at 80° to 90°F. for a month and then examined for spoilage. If no swells are present, representative cans should be cut for the possible presence of sours. If there is no spoilage, the operating conditions chosen may be considered satisfactory.

### Considerations in Selecting Operating Temperatures

Most low-acid foods do not lose quality when given short time-high temperature processes considerably in excess of those necessary for sterility. Consequently F° values between 15 and 30 have usually been selected, which provides sufficient heat to kill the spores even of most thermophiles. These compare with F° values of 2 to 10 normally used in conventional processing procedures. In the case of products particularly sensitive to heat, it may be necessary to determine processes safe against spores of *Clostridium botulinum*. Under these circumstances considerable thermal death time work may be necessary. In determining the F° value of a process, the lethality of the heating and cooling parts of the cycle are not included. This would represent from 8 to 12 percent of the total lethality.

Temperatures for the product sterilizer are usually specified as being taken at the end of the holding tube. This gives the lowest temperature likely to be encountered. Under operating conditions there is liable to be a temperature fluctuation of from 2° to 4°F. at the end of the holding tube. Therefore, to insure that the temperature does not fall below the predetermined minimum, the operator should set his controller to maintain the temperature about 4°F. high.

Temperatures for container and cover sterilizers have usually been estimated at 20° to 25°F. above the highest temperature at which spoilage occurred. It must be remembered that this is an equilibrium temperature of the sterilizing units. Since the temperature during operation may fluctuate as much as 10°F. the equipment should be operated at about 10°F. above the recommended level.

# FACTORS INFLUENCING SHELF LIFE OF CANNED FOODS

Presiding: W. J. Mutschler, Continental Can Company, Chicago

Address: "Relationship of Canning Procedures to Shelf Life of Canned Foods"—A. G. Skibbe, Continental Can Company, Chicago

Address: "The Effect of Steel Base Composition and of Tin-coating Weight"—V. Walter Vaurio, U. S. Steel Corporation, Pittsburgh

Address: "The Effect of Storage Temperature"—Dr. D. K. Tressler, Quartermaster Food and Container Institute, Chicago

Address: "Preventing Corrosion of Exterior of Cans"—A. R. Beall and E. V. Cassady, American Can Company, Maywood, Ill.

## Relationship of Canning Procedures to Shelf Life of Canned Foods

**By A. G. Skibbe,**
**Continental Can Company, Inc.**

Canning procedures are among the more important variables affecting the shelf life of commercially canned food products. Procedures for canning vary considerably and obviously it would be impossible to cover all of the variables in this paper. Therefore, we have been selective in the types of data to be included in this discussion and will confine the presentation to information on vacuum and headspace volume as it affects the shelf life of processed canned food products. These two factors may be measured to evaluate the result of variations in canning procedures.

In most canning practices the aim is to obtain maximum vacuum as economically as possible. The amount of vacuum varies from product to product and also among canners of the same product. There are several reasons for obtaining vacuum in canned foods. These include: the maintenance of can ends in a concave position during normal storage; reduction of oxygen; and the prevention of permanent distortion of can ends during thermal processing (3).

Maintaining the original shape of the can is important to the saleability of the product. Bacterial spoilage usually results in gas formation, causing the ends to bulge. Consequently, any distortion of the end from the normal concave shape is taken as an indication of spoilage by the industry and by the consumer. Cans with inadequate vacuum will also bulge when exposed to adverse temperature and pressure conditions and will likewise be considered unacceptable.

A low oxygen content in canned foods is desirable to minimize undesirable chemical changes in the product. Establishment of a vacuum is one way of minimizing oxygen content. Some products tend to corrode the container with resultant libera-

tion of hydrogen and a headspace under fairly high initial vacuum is necessary to permit the accumulation of liberated gas without distorting the ends.

During thermal processing, the can contents expand considerably and this may result in permanent distortion of the ends, unless some provision is made for this expansion. This may be accomplished by providing adequate headspace under vacuum.

Since shelf life may have a number of meanings, for the purpose of this discussion we shall define shelf life as the time that a packed food can will remain at a storage condition before the ends of the can flip out or become a springer.

The various methods used to obtain vacuum in canned foods were reviewed by Peterson (5) and Boyd, Heinen and Parrin (2). The significance of adequate initial vacuum in canned foods and its measurement were reviewed by Boyd and Bock (1) at the N.C.A. Convention in 1952. Concerning the effects of canning procedures on shelf life, Hirst and Adam (4) reported specific packing procedures that may be used to improve the shelf-life of canned loganberries. For example, they showed that canned loganberries packed without exhausting had a shelf life of 20 weeks at 25 percent failures, when stored at 95° F. Exhausting for 6 minutes at 190°F. increased the shelf life to 30 weeks. These references provide background information on this subject.

It is hoped that the data presented here will help the canner to understand better how vacuum and headspace volume will affect the shelf life of canned food products. The data we will present consist of two main parts: data accumulated from a large-scale experimental pack of blueberries, and an accumulation of shelf life data on apricots and tomatoes packed in experimental cans over a period of years.

## Experimental Procedure

A large-scale experimental test pack of blueberries was made in Florida in 1947, in order to evaluate several variables affecting the shelf life of processed canned foods. The effects of variations in plate types and tin-coating weights, and the effects of canning procedures on shelf life were studied.

Can bodies and ends were manufactured from plain type L plate, with 1.50# hot dip tin coating, on our commercial can-making lines. From the 1,000 cans manufactured, 120 were picked at random and packed in Florida on commercial cannery equipment. The blueberries were washed and filled on a rotary hand packed filler. Hot water (approximately 200°F.) was added and the filled cans were then treated in a hot water exhaust at 204°F., closed, and processed as indicated in Table I.

**TABLE I**

**Selected Packing Variables Included in Experimental Test Pack of Blueberries**

| Exhaust Time in Minutes | Closing Temperature °F. | Process Time in Minutes (212° F.) |
|---|---|---|
| 0 | 130 | 17 |
| 2 | 150 | 15 |
| 6 | 180 | 8 |
| 10 | 187 | 3 |

The variation in closing temperature necessitated varying the processing time in order to attain commercial sterility. Normal packing conditions resulted in a gross headspace of approximately 7/16 inches.

Thirty-six cans of each variable were stored at room temperature and 36 at 98°F. for shelf life studies. The remaining cans were used for visual examination of the can and product. Only the 98°F. shelf life data will be presented here since many of the cans stored at room temperature have not as yet failed.

The cans were flip tested initially and each month thereafter until failure. Early indications of hydrogen springers may be predicted by determining the loss of vacuum by the flip tester. The flip tester is illustrated in Figure I.

With the flip tester apparatus, an external vacuum is applied gradually to one end of the can. The amount required to "flip out" the end is approximately equal to the internal vacuum of the can plus the resistance of the end to spring outward. The vacuum gauge reading at the time the end springs out—as indicated by a pinging sound—is the flip vacuum.

However, this method has certain limitations. Since the maximum external vacuum that can be produced is limited to approximately 30 inches of mercury, the actual internal vacuum will be somewhat less since the pressure to flip out the end must be subtracted from the external applied vacuum.

Variations in headspace of the packed can, can diameter, stiffness of end contour, and change in can volume when the end is distended are other factors which also must be considered. However, by controlling some of these variables it is possible to make an approximate determination of internal vacuum, without destroying the packed can. Being able to observe the same packed cans over extended storage periods is a decided advantage and outweighs the limitation of the method previously mentioned.

As the individual cans failed, the headspace volume was measured. This was done by measuring the volume of water necessary to fill the can through two holes in the can end adjacent to the chuck wall. This procedure measures the headspace volume at the time the ends are ready to flip out, of specific interest in shelf life studies.

**FIGURE I**

**Flip Tester Apparatus**

## Results and Discussion

The relationship between the variables was determined by statistical procedures. Correlation studies were made, and the line of best fit to the data was constructed by mathematical procedures.

Figure II shows the relationship of initial flip vacuum to headspace volume for individual cans of blueberries. Even though there is a significant statistical correlation between initial flip vacuum and headspace volume, considerable spread is shown by these data.

**FIGURE II**

**Relationship of Initial Flip Vacuum to Headspace Volume of Canned Blueberries (Individual Cans)**

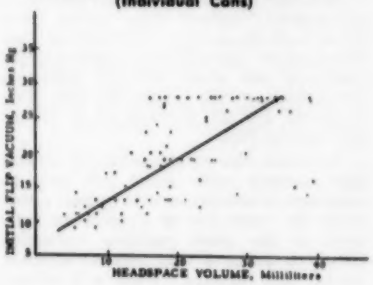



**FIGURE III**

**Relationship of Headspace Volume to Shelf Life of Canned Blueberries Stored at 98°F. (Individual Cans)**

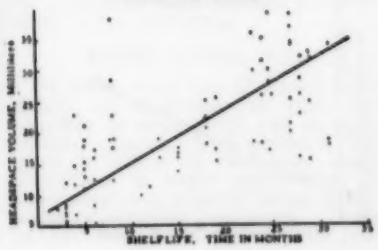
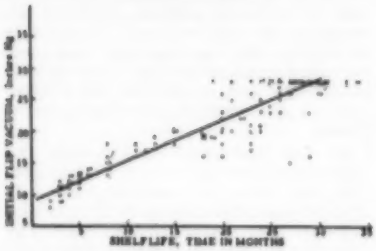


FIGURE IV

Relationship of Initial Flip Vacuum to Shelf Life of Canned Blueberries Stored at 98°F. (Individual Cans)



The relationship of headspace volume to shelf life for individual cans of blueberries (Figure III) shows significant correlation but the precision is no more accurate than that shown in Figure II. Therefore, predicting shelf life from headspace volume or vice versa would not be very precise for individual cans.

When the initial flip vacuum data for individual cans made of plain, 1.50# hot dip tin plate were correlated with shelf life, a higher correlation was obtained. As shown in Figure IV, the spread of the points about the line is much less than as shown in Figure III.

The headspace volume and initial flip vacuum show correlation with shelf life and are among the important factors affecting it. However, the measurement of the initial flip vacuum is the more precise testing method to determine shelf life.

In order to determine shelf life more accurately, rather than using data from individual cans, Continental Can Company's laboratories customarily compare the shelf life of different variables on the basis of the time required for 25 percent of a lot of 36 cans to fail.

To show the relationship of initial flip vacuum with shelf life and to compare blueberries with other products, the shelf life at 25 percent failures of the three packing variables listed in Table I was plotted against initial flip vacuum. Figure V shows

FIGURE V

Relationship of Initial Flip Vacuum to Shelf Life (at 25 Percent Failures) of Canned Blueberries Stored at 98°F.

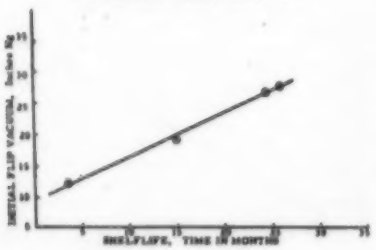
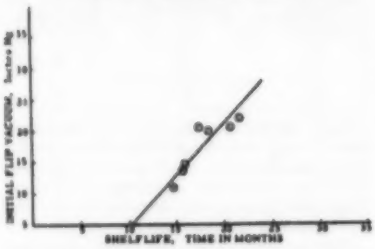


FIGURE VI

Relationship of Initial Flip Vacuum to Shelf Life (at 25 Percent Failures) of Canned Apricots Stored at 98°F.



that there is a high correlation between flip vacuum and shelf life as indicated by the small spread of the points about the line.

To evaluate the effect of vacuum on shelf life for other products, data were accumulated on apricots and tomatoes and statistically analyzed. The data on apricots were obtained over a period of five years with seven experimental packs in plain, 1.50# hot dip tin plate cans. As indicated in Figure VI, the data show high correlation of the initial flip vacuum with shelf life at 25 percent failures.

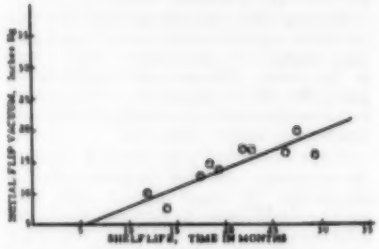
The data on tomatoes were obtained over a period of five years with ten experimental packs in plain, 1.25# hot dip tin plate cans. As indicated in Figure VII, the data show high correlation of the initial flip vacuum with shelf life at 25 percent failures.

In order to compare the three products under study, the average flip vacuum necessary to flip the ends of the empty cans which had been packed with each product was subtracted from the average initial flip vacuum to give the approximate internal vacuum of the cans. Figure VIII illustrates this comparison. The blueberries were packed in 307 x 409 cans, the ends of which flipped out at an average of 6.6 inches of mercury, under atmospheric conditions. The ends of the 307 x 409 tomato cans flipped out at an average of 8.6 inches of mercury while the ends of the 401 x 411 apricot cans flipped out at an average of 5.0 inches.

From the comparison made in Figure VIII it is evident that it is more important to control and maintain a good vacuum in some products than in others. Of the three products compared, tomatoes are the most sensitive to a change in vacuum. For example, assuming commercial packing conditions of 10-15 inches of vacuum, an increase of 5 inches of vacuum for tomatoes will increase the shelf life eight months, while an increase of 5 inches of vacuum for blueberries shows an increase in shelf life of seven months. For apricots, a 5-inch increase in vacuum will show an increase of three months in shelf life.

FIGURE VII

Relationship of Initial Flip Vacuum to Shelf Life (at 25 Percent Failures) of Canned Tomatoes Stored at 98°F.



Even though the tomatoes are the most sensitive to changes in vacuum, it is very obvious that the corrosivity of the product is also very important. The data in Figure VIII shows that tomatoes are the least corrosive and the blueberries the most corrosive of the three products compared. For example, blueberries packed with 5 inches initial internal vacuum would have a shelf life of approximately 3½ months. Apricots similarly packed would have 13½ months shelf life and tomatoes about 20 months. Therefore, it is very important to obtain adequate initial vacuum for corrosive products, such as blueberries, in order to get satisfactory commercial shelf life.

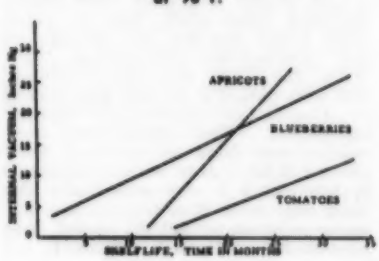
## Summary and Conclusions

Experimental test packs of blueberries were made in order to evaluate the effects of vacuum and headspace volume on shelf life. Shelf life data on experimental packs of tomatoes and apricots were compared with these data. Headspace volume and initial flip vacuum show correlation with shelf life, but the measurement of initial flip vacuum is the more precise testing method to determine shelf life.

Comparison of the relationship of internal vacuum with shelf life (at 25 per cent failures) of apricots, blueberries and tomatoes shows it is more important to control and maintain a good vacuum in some products than in

FIGURE VIII

Comparison of Relationship of Internal Vacuum with Shelf Life (at 25 Percent Failures) of Canned Foods Stored at 98°F.



others. Of the three products compared, shelf life of tomatoes was most affected by initial vacuum and apricots the least affected.

Results indicate that high initial vacuums are desirable from the standpoint of shelf life but the use must be tempered by the strength or paneling resistance of the container. All packages are designed to meet certain technical and economical specifications and in many cases these must be worked out between the individual canner and the can manufacturer.

ACKNOWLEDGEMENT

The author gratefully acknowledges the cooperation and assistance of his associates at Continental Can Company. Special thanks are accorded to Miss Mae Goodwin Tarver and Mr. Marshall Switzer of our Mathematical and Statistical Section for statistical analysis of these experimental data and to Mrs. Anna May Schenck for assistance in the preparation of this paper.

BIBLIOGRAPHY

(1) Boyd, J. M. and J. H. Bock, *Vacuum in Canned Foods—Its Significance and Its Measurement*, 1952. Continental Can Company, Inc., Research Division Bulletin No. 31

(2) Boyd, J. M., J. M. Heinen and F. W. Parrin, *Engineering the Air Removal from Canned Foods*, 1952. Continental Can Company, Inc., Research Division Bulletin No. 29

(3) Clough, Ray D., "The Function of Vacuum in Canned Foods," *Canning Age*, July 1928

(4) Hirst, F. and W. B. Adam, *Hydrogen Swells in Canned Fruits*. University of Bristol Research Station, Campden, Gloucestershire, March, 1937

(5) Peterson, G. T., *Methods of Producing Vacuum in Cans*, 1949. Continental Can Company, Inc., Research Division Bulletin No. 18

## The Effect of Steel Base Composition and of Tin-coating Weight

**By V. W. Vaurio**
**U. S. Steel Corporation**

I have been invited to discuss the "Internal Corrosion of Cans—Effect of Steel-Base Composition and of Tin-Coating Weight." Before tackling this subject, I should like to pay tribute to the container manufacturers and also to their suppliers, because the can of today is an engineering masterpiece that permits the distribution of wholesome, nutritious, appetizing foods to all areas in all seasons.

The can of today is tailored for the specific product that it is to contain. The can for corn is different from the can for cherries or the can for meats or the can for beer. Each product presents its own particular problem. Just as the design engineer selects the proper fabricating material for each part of a structure or machine, so does the can manufacturer select the proper raw materials for each application. In certain cases, such as in the high-temperature processing of foods, the strength of the container is of paramount importance; therefore, he selects the strongest tin plate. In other instances, corrosion resistance may be the governing factor.

Tin plate is essentially thin, mild, steel sheet coated with a much thinner layer of tin, but it is a fairly complex product, as is indicated in Figure I. Metallurgically, we can consider tin plate as a nine-layer sandwich. The steel base constitutes the filling or core, and on each side are successively an alloy layer, a tin layer, a protective oxide layer, and an oil layer. How tin plate stands up in use depends on the nature of one or more of the layers. Table I indicates how some of these layers can affect corrosion in different environments.

### Effect of Tin-Coating Weight

Intuitively, we feel that the heavier tin coatings should yield more-corrosion-resistant tin plate, but consider Figure II, which R. R. Hartwell presented in his discussion before the technical session of the National Canners Convention in 1952. These data for grapefruit juice failed to substantiate the expected relation between tin-coating weight and shelf life. Some lots of No. 50 electrolytic tin plate were as good as or better than the 1.25 coke-plate lots. Figures III and IV, prepared by the Can Manufacturers Institute and presented by D. F. Sampson two years ago before this technical session, further illustrate the erratic behavior of tin-coating weight, as does Figure V, prepared from Continental Can data. In the charts just shown, each bar represents a different lot of tin plate and consequently a different batch of steel. Thus, some of the differences may be attributable to the steel base. What is the effect of tin-coating weight if we hold the steel base constant?

In the U. S. Steel Corporation Laboratories, we have made a number of pack-test investigations on the effect of increasing the tin-coating weight, and we find that for a given steel, the effect is essentially linear—that is, the effect is a straight-line function. One such experiment involved four coils of different grades of steel. Each steel was coated to five different coating weights, No. 25, No. 50, No. 75, and No. 100 electrolytic tin plate and 1.50 pot-yield coke tin plate. These were fabricated into No. 2 cans, both plain and lacquered, and were pack tested with dried prunes in water. The plain cans were also tested with tomato juice, and the lacquered cans with RSP cherries.

Figure VI shows the results of tests with prunes. Most of the points fall pretty well on the lines. The data for the hot-dipped items are more or less erratic. Figure VII shows the results of lacquered-can tests with RSP cherries. These data are similar to the prune data, except that the slopes of two of the curves are greater. Tin coating is more effective with cherries than with prunes. Figure VIII shows the results of plain-can tests with tomato juice. The points fall fairly closely to straight lines, but the slopes are much greater than those on the preceding charts.

Thus, we have seen that for a given steel, increasing the tin-coating weight increases the shelf life. The obvious inference, then, is that the erratic results presented by Hartwell and Sampson must have been due to differences in the steel base.

### Effect of Steel Base

In what ways can the steel base differ? In a number of ways, for example, in composition and in processing. Among steel products tin plate is unique in that very small differences in either composition or processing can produce large differences in corrosion resistance. Those of you who are familiar with con-

FIGURE I

Cross Section of Tin Plate, Schematic

struction materials know that rather large changes in composition are necessary to achieve changes in corrosion resistance of other steel products.

The compositions of tin-plate steel are given in Table II. The main differences among the grades are the phosphorus content and the so-called tramp-element content (copper, nickel, and chromium). Type L is the most restrictive composition, and it is specified for the most corrosive foods. Type MR is similar to Type L, except that no restriction is placed on the tramp-element content. Type MC differs from Type MR in that the phosphorus limits for Type MC are higher. Phosphorus is a hardening element, and Type MC steels are used where buckling strength is the main consideration.

It will be noted that all tin plate is made with only residual silicon which is generally about 0.010 percent maxi-

**TABLE 1**

**Tin-Plate Factors Controlling Corrosion Rate; Possible Corrective Action**

| Environment | Type Corrosion | Tin-Plate Factors Controlling Rate of Corrosion | Corrective Action |
|---|---|---|---|
| Air | Rusting | Quantity of exposed base (porosity) | Reduce porosity, improve protective film |
| Fruits, plain cans | Swells and perforations | Tin coating weight, steel base | Improve steel base |
| Some non-acid products, plain cans | Detinning, staining | Tin coating protective film | Improve tin coating, improve protective film |
| Fruits, lacquered cans | Swells and perforations | Steel base, tin coating, protective film, oil film | Improve steel base, use adequate tin coating, improve protective film, use proper oil film |

**FIGURE II**

**Corrosion of Tin Cans by Grapefruit Juice—Lot to Lot Variation in 1943 American Can Company Data**

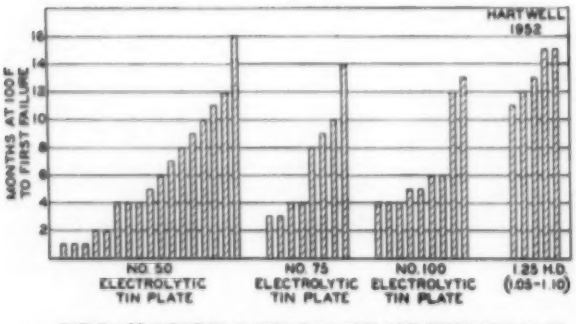

HARTWELL
1952
MONTHS AT 100 F TO FIRST FAILURE
NO. 50 ELECTROLYTIC TIN PLATE
NO. 75 ELECTROLYTIC TIN PLATE
NO. 100 ELECTROLYTIC TIN PLATE
1.25 H.D. (1.05-1.10)
SHELF-LIFE VARIATION IN INDIVIDUAL LOTS OF ELECTROLYTIC PLATE OF INDICATED COATING WEIGHT
(1943 PACK-GRAPEFRUIT JUICE IN NO. 2 PLAIN CANS)

**FIGURE III**

**Variation in Service Life of Individual Lots of Tin Plate: Peaches in Plain Cans, 100° F.**

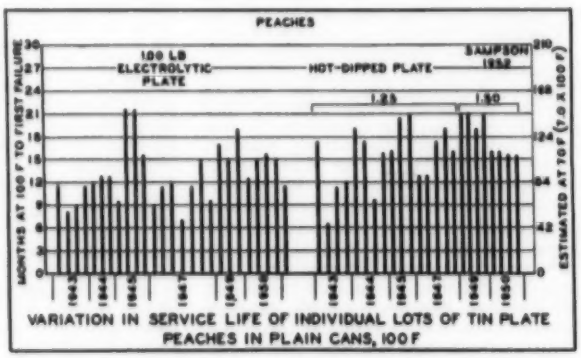

PEACHES
100 LB ELECTROLYTIC PLATE
HOT-DIPPED PLATE
SAMPSON 1952
1.25
1.50
MONTHS AT 100 F TO FIRST FAILURE
ESTIMATED AT 70 F (1.0 X 100 F)
VARIATION IN SERVICE LIFE OF INDIVIDUAL LOTS OF TIN PLATE
PEACHES IN PLAIN CANS, 100 F

**FIGURE IV**

**Variation in Service Life of Individual Lots of Tin Plate: Grapefruit Juice in Plain Cans, 100° F.**

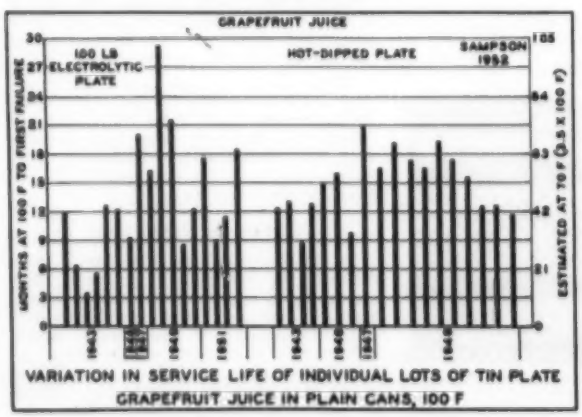

GRAPEFRUIT JUICE
100 LB ELECTROLYTIC PLATE
HOT-DIPPED PLATE
SAMPSON 1952
MONTHS AT 100 F TO FIRST FAILURE
ESTIMATED AT 70 F (0.5 X 100 F)
VARIATION IN SERVICE LIFE OF INDIVIDUAL LOTS OF TIN PLATE
GRAPEFRUIT JUICE IN PLAIN CANS, 100 F

**FIGURE V**

**Variation in Service Life of Individual Lots of Tin Plate: Tomatoes in Plain Cans, 98° F.**

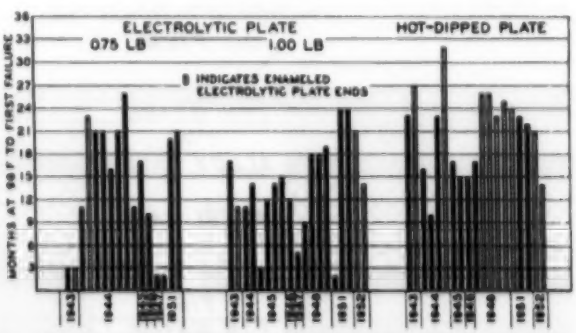

ELECTROLYTIC PLATE
HOT-DIPPED PLATE
0.75 LB
1.00 LB
§ INDICATES ENAMELED ELECTROLYTIC PLATE ENDS
MONTHS AT 98 F TO FIRST FAILURE
VARIATION IN SERVICE LIFE OF INDIVIDUAL LOTS OF TIN PLATE
TOMATOES IN PLAIN CANS, 98 F
CONTINENTAL CAN COMPANY, METAL DIV., RES. AND DEV. DEPT., 1954

FIGURE VI

Corrosion of Plain and Lacquered Cans by Prunes, 100° F.

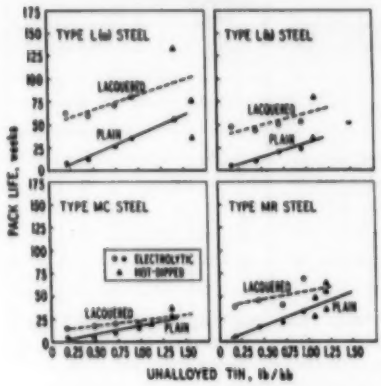



FIGURE VII

Corrosion of Lacquered Cans by RSP Cherries, 100° F.

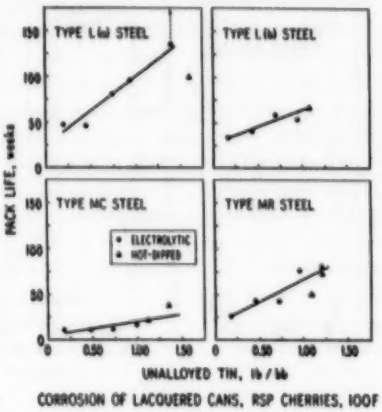
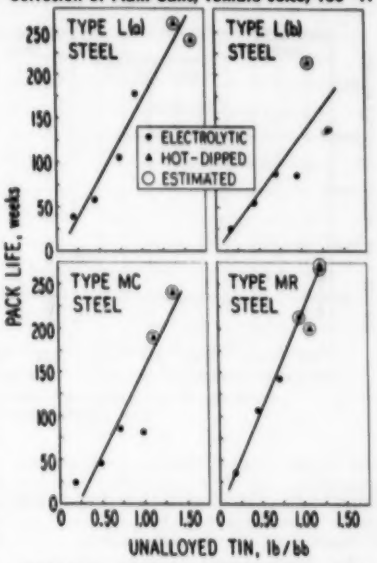



FIGURE VIII

Corrosion of Plain Cans, Tomato Juice, 100° F.




mum. In years gone by when tin plate was made by the hot pack-roll method, silicon was sometimes added to steel to facilitate opening the packs but it was discovered that tin plate from such steels had poor corrosion resistance. The composition factors that influence modern can corrosion are primarily phosphorus and copper and these will be discussed in the present paper.

In 1940, Hartwell discussed the "Influence of Steel Base Composition on Service Life of Tin Plate Containers" at the Annual Convention of the American Society for Metals. Since this was before the advent of electrolytic tin plate, his data were confined to tests with coke-plate cans, but his conclusions are still valid, as will be seen.

The next five charts (Figures IX, X, XI, XII and XIII) show the influence of copper and of phosphorus on the service life of lacquered coke-plate cans tested with RSP cherries, black cherries, Italian prunes, loganberries, and strawberries. The deleterious effect of phosphorus stands out in sharp relief in every instance. The influence of copper is not so clear cut. With loganberries, for instance, some of the best lots had high copper contents. It is also interesting to note that the work of English investigators (Hoar, Morris, and Adam), reported in the book *Tin Plate* by Hoare and Hedges, indicates that for certain English fruits, copper in the steel base is probably beneficial. However, the consensus in this country is that low-copper Type L steel is preferred for fruits to be packed in lacquered cans.

The effect of steel composition on the corrosion performance of electrolytic tin plate has been studied in the U. S. Steel Laboratories to some extent. The data in the previous figures showing the influence of tin-coating weight are redrawn on the next chart (Figure XIV). The high-phosphorus Type MC lots are consistently poorer than the other steels with the acid fruits, both in plain cans and in lacquered cans. The effect with tomato juice is not very marked. The effect of copper is indicated by comparing the type MR (0.10 copper) with the Type L lots. It will be noted that there are two Type L Lots in this figure. The Type L(a) plate was a commercially processed lot, whereas the Type L(b) plate was an experimental lot purposely processed in such a manner as to produce a fast-corroding tin plate, as judged by plain-can prune-pack tests. In the present pack tests, the effect of copper can be evaluated by comparing the performance of Type L(a) with Type MR (copper bearing) plate. In the plain-can tests with prunes, the two lots are similar, but in the lacquered-can tests,

TABLE 2

Chemical Specifications for Base Steels

| Element | Type L (T-1, 2, 3, 4) | Type MR (T-1, 2, 3, 4) | Type MC (T-5) | Special for Beer Ends Only (T-6) |
|---|---|---|---|---|
| | (percentage permitted) | | | |
| Carbon | .05—.12 | .05—.12 | .05—.12 | .05—.15 |
| Manganese | .25—.60 | .25—.60 | .25—.60 | .25—.70 |
| Sulphur | .05 max. | .05 max. | .05 max. | .05 max. |
| Phosphorus | .015 max. | .020 max. | .07—.11 | .10—.15 |
| Silicon | .010 max. | .010 max. | .010 max. | residual |
| Copper | .06 max. | .20 max. | .20 max. | residual |
| Nickel | .04 max. | no limitation specified | | |
| Chromium | .06 max. | no limitation specified | | |
| Molybdenum | .05 max. | no limitation specified | | |
| Arsenic | .02 max. | no limitation specified | | |

Data from "Metal Cans of the Future" by K. W. Brighton, R. W. Pilcher, and R. H. Lueck, *Food Technology*, Sept., 1954.

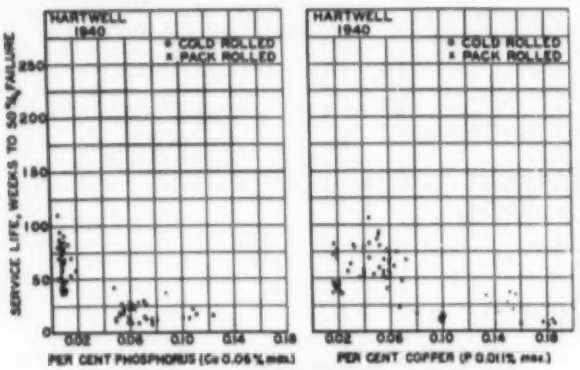
TABLE 3

Percent of Failures in Lacquered Cans Caused by Perforation

| Tin Coating | Type L(a) | Type L(b) | Type MR | Type MC |
|---|---|---|---|---|
| Product: Cherries | | | | |
| 0.25 | 0 | 0 | 58.4 | 97.9 |
| 0.50 | 0 | 0 | 20.9 | 87.5 |
| 0.75 | 0 | 4.3 | 8.4 | 97.9 |
| 1.00 | 0 | 0 | 4.2 | 83.0 |
| standard coke | 0 | 0 | 6.6 | 75.9 |
| Product: Prunes | | | | |
| 0.25 | 0 | 0 | 22.6 | 10.3 |
| 0.50 | 1.1 | 0 | 23.0 | 5.6 |
| 0.75 | 0 | 0 | 4.5 | 11.2 |
| 1.00 | 0 | 0 | 21.0 | 12.2 |
| standard coke | 0.6 | 0 | 5.0 | 13.7 |

**FIGURE IX**

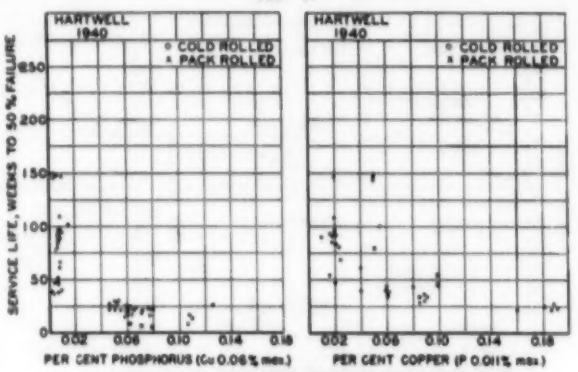
**Corrosion of Lacquered Hot-dipped Tin Plate Cans: RSP Cherries, 100° F.**


HARTWELL 1940
○ COLD ROLLED
× PACK ROLLED
SERVICE LIFE, WEEKS TO 50 % FAILURE
PER CENT PHOSPHORUS (Cu 0.06 % max.)
PER CENT COPPER (P 0.011 % max.)

CORROSION OF LACQUERED HOT-DIPPED TIN-PLATE CANS, RSP CHERRIES, 100 F

**FIGURE X**

**Corrosion of Lacquered Hot-dipped Tin Plate Cans: Black Cherries, 100° F.**


HARTWELL 1940
○ COLD ROLLED
× PACK ROLLED
SERVICE LIFE, WEEKS TO 50 % FAILURE
PER CENT PHOSPHORUS (Cu 0.06 % max.)
PER CENT COPPER (P 0.011 % max.)

CORROSION OF LACQUERED HOT-DIPPED TIN-PLATE CANS, BLACK CHERRIES, 100 F

the Type L(a) plate is significantly superior. In the plain-can tomato juice tests, however, the Type MR plate exhibited the best pack performance of all the lots tested.

An interesting sidelight in these lacquered-can tests is that the Type L lots failed by hydrogen-swell formation, whereas a substantial percentage of the Type MC and Type MR cans failed by perforations (Table III). We have no explanation for this difference in behavior.

From the previous pack data, one might have inferred that copper is beneficial for tomato juice cans, but consider the results of another experiment in which copper was added to ingots of Type L steel to provide a range of copper of 0.02, 0.11, and 0.24 percent. In this experiment (Figure XV), copper was apparently detrimental with four products including tomato juice. Why the discrepancy with the earlier experiments? Perhaps a difference in food product. Perhaps some slight difference in processing the tin plate.

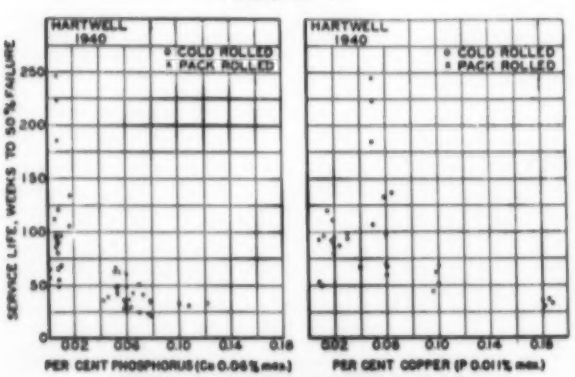
### Other Factors

It is apparent that the composition of the steel base can have some effect on corrosion performance, but the effect is not clear. Some other factor besides steel composition can affect the results, and this is the area in which intensive research is currently being conducted. It is generally recognized that the quality of tin plate depends on how efficiently the tin coating can protect the steel base from corrosive attack. We can illustrate this protective action of tin by a simple experiment. If we attach tin to steel, making sure of electrical contact, and subject the couple to the action of fruit acid, we can measure the rate of corrosion. By making the iron-tin couples on a can end, we have a built-in corrosion cell whereby we can use the diaphragm action of the can end as a measure of the corrosion. Figure XVI shows several schemes of tin-iron couples.

Figure XVII shows the results of one experiment with a tin wire grid type of couple. The two steels were of Type L composition but Steel A corroded much faster than Steel B. We might say that Steel A was protected less efficiently than Steel B. We can further illustrate this concept by another experiment, this time using the collar-button type of tin-iron couple but varying the ratio of the area of exposed tin. Figure XVIII shows the result of our experiment. As the ratio of tin area to iron area increases, the corrosion resistance increases, but the curve for Steel A is flatter than that for Steel B. Steel B is protected more efficiently than Steel A.

**FIGURE XI**

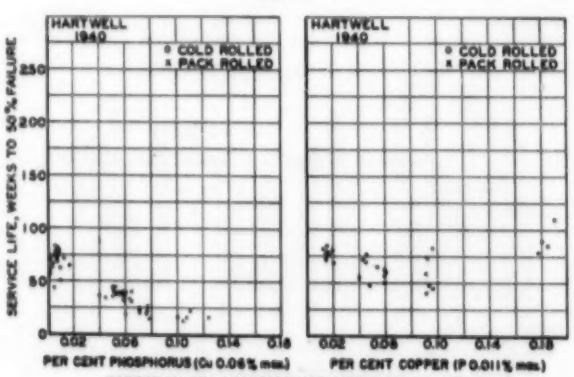
**Corrosion of Lacquered Hot-dipped Tin Plate Cans: Fresh Italian Prunes, 100° F.**


HARTWELL 1940
○ COLD ROLLED
× PACK ROLLED
SERVICE LIFE, WEEKS TO 50 % FAILURE
PER CENT PHOSPHORUS (Cu 0.06 % max.)
PER CENT COPPER (P 0.011 % max.)

CORROSION OF LACQUERED HOT-DIPPED TIN-PLATE CANS, FRESH ITALIAN PRUNES, 100 F

**FIGURE XII**

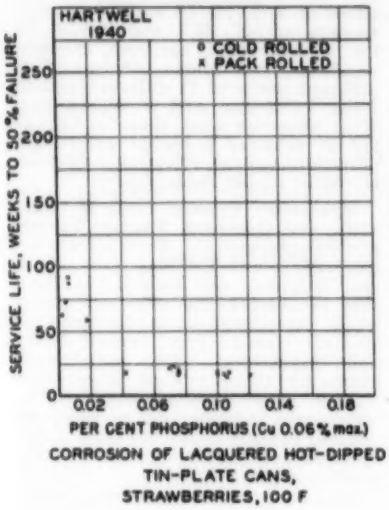
**Corrosion of Lacquered Hot-dipped Tin Plate Cans: Loganberries, 100° F.**


HARTWELL 1940
○ COLD ROLLED
× PACK ROLLED
SERVICE LIFE, WEEKS TO 50 % FAILURE
PER CENT PHOSPHORUS (Cu 0.06 % max.)
PER CENT COPPER (P 0.011 % max.)

CORROSION OF LACQUERED HOT-DIPPED TIN-PLATE CANS, LOGANBERRIES, 100 F

**FIGURE XIII**

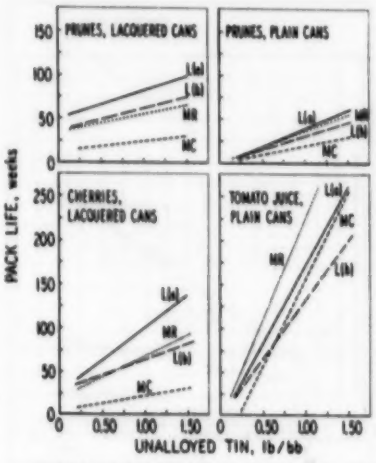
**Corrosion of Lacquered Hot-dipped Tin Plate Cans: Strawberries, 100° F.**




CORROSION OF LACQUERED HOT-DIPPED TIN-PLATE CANS, STRAWBERRIES, 100 F

**FIGURE XIV**

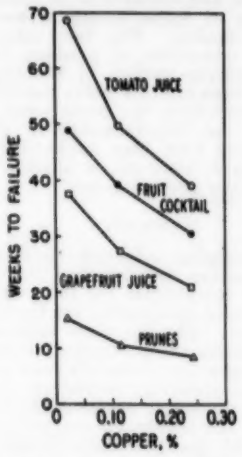
**Effect of Steel Base on Pack Life, 100° F.**




EFFECT OF STEEL BASE ON PACK LIFE, 100F

**FIGURE XV**

**Influence of Copper Content on Pack Life, No. 2 Cans, 100° F.**




INFLUENCE OF COPPER CONTENT ON PACK LIFE, NO. 2 CANS, 100F

**FIGURE XVI**

**Various Types of Tin-Iron Couples**

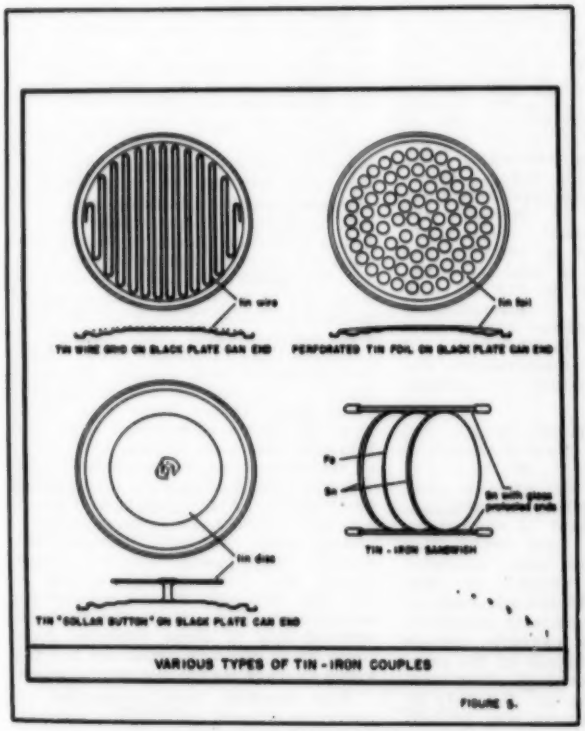

tin wire
TIN WIRE GRID ON BLACK PLATE CAN END
tin foil
PERFORATED TIN FOIL ON BLACK PLATE CAN END
tin disc
TIN "COLLAR BUTTON" ON BLACK PLATE CAN END
Fe
Sn
TIN - IRON SANDWICH
VARIOUS TYPES OF TIN - IRON COUPLES

FIGURE 5.

**FIGURE XVII**

**Vacuum Loss Curves in Prune Juice for Two Steels Coupled to Tin**

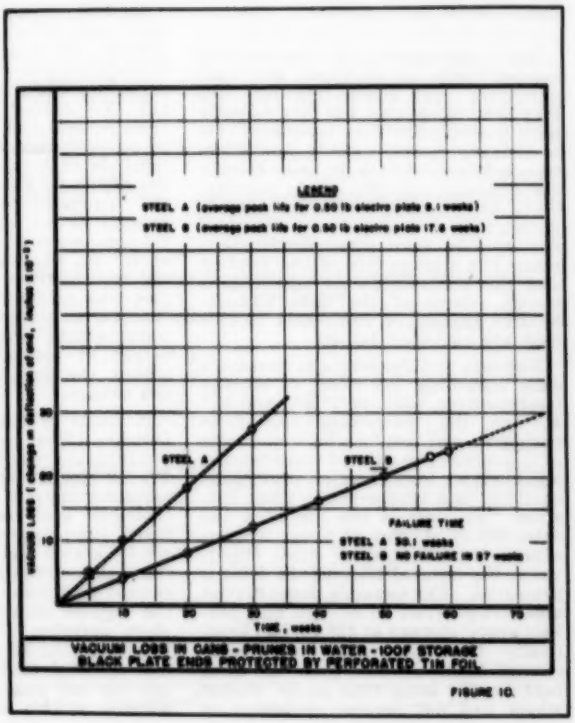



FIGURE 10.

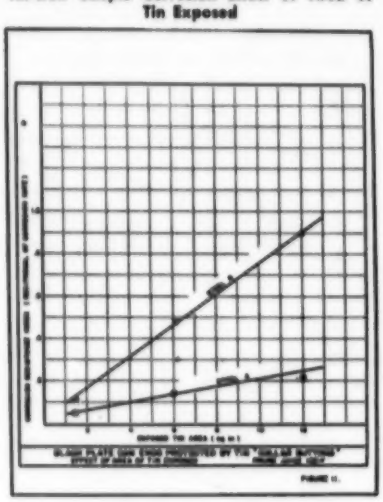
How to make steel more readily protected by tin is the subject of continued research. Improvements have been made and continue to be made in each step of manufacture to assure uniform quality. The fact that increasing quantities of products that were formerly packed in hot-dipped tin plate cans are now being packed in plain electrolytic tin plate cans attests to the improvements in steel quality that have been made to date. This subject, however, is outside the scope of the present paper.

SUMMARY

For maximum corrosion resistance, the can maker specifies first the correct steel composition for the product and, secondly, he specifies the tin-coating weight. The tin plate manufacturer controls the processing through the various steps of manufacture such as rolling, cleaning, annealing, pickling, and tinning in such a fashion as to attain the maximum corrosion resistance of the particular grade of tin plate.

FIGURE XVIII

Tin-Iron Couple Corrosion Effect of Area of Tin Exposed



## The Effect of Storage Temperature on the Shelf Life of Canned Foods

By D. K. Tressler,
J. H. Mitchell, Jr., and
O. J. Stark, Quartermaster
Food Container Institute

The importance of maintaining canned foods at relatively low temperatures (but above freezing) has long been recognized, but only recently have quantitative data been available to indicate clearly exactly how effective refrigeration is in maintaining the vitamin content, color, acceptability and "quality" of canned foods during long storage periods. Further, few studies have attempted to correlate the storage life of the product and the temperature at which it is stored. Some of the more comprehensive reports of researches in this field are reviewed below:

Kohman and Sanborn (8) presented data regarding the effect of storage temperatures (32°, 50°, 70°, and 97° F.) on the percentage loss from springers and perforations and rate of loss of color in canned strawberries, loganberries, bing cherries, sour pitted cherries, and blueberries. They conclude, "not only is the life of a can extended by storage at lower temperatures, but, what is of equal importance, the natural color of the fruit is preserved. For example, loganberries and strawberries after two and one-half years' storage at 32° F., had practically the appearance of freshly canned berries. The color of those held for the same time at 50° F. but which had not become springers or perforated, gave evidence of considerable bleaching. While those held at higher temperatures had much earlier become a total loss."

Beattie, Wheeler and Pederson (1) and Pederson, Beattie and Stotz (12) studied the changes in bottled fruit juices during storage at various temperatures (34°, 50°, 70°, 86°, 98° and 113° F.) noting particularly loss of ascorbic acid and sucrose and changes in color, flavor, and viscosity. They conclude that notable changes occur, the degree of change depending upon the temperature of storage and amount of air present. Only slight changes were noted in samples held at 34° F., whereas in most instances, the deterioration in the 113° F. samples was profound. Deterioration of fruit juices stored at the intermediate temperatures was in the order of height of storage temperature, the higher the temperature the greater the change.

A study by Guerrant, Vavich, and Dutcher (7) of the effect of times and temperature (30°, 85°, 40°, and 110° F.) of storage on the ascorbic acid, carotene, thiamin, riboflavin, and panthothenic acid content of canned tomato juice, green lima beans, and whole kernel yellow corn, indicated that the vitamin content of each canned food was affected adversely at the highest temperature in relatively short periods. For example, tomato juice retained 92 percent of the original ascorbic acid content after storage for one year at 30° F.; only 20 percent of this vitamin was present after the product had been stored for the same period at 110° F. Further work by Guerrant, Fardig, Vavich, and Ellenberger (6) considered the effect of 4, 8, 12, 18 and 24 months' storage at 50°, 65°, and 80° F. on the ascorbic acid, carotene, thiamin, riboflavin, and niacin content of 32 different packs of 11 different canned foods (2 fruits and 9 vegetables). They observed that those stored at 50° F. retained a higher percentage of each of the five vitamins than those stored at higher temperatures.

Moschette, Hinman, and Halliday (10), and Guerrant, Fardig, Vavich, and Ellenberger (6), Sheft, Griswold, Tarlowsky, and Halliday (13), Monroe, Brighton and Bendix (9) have also considered the effect of warehouse temperatures on the rate of loss of vitamins from canned fruits and vegetables. The conclusions drawn by these workers from their vitamin retention-temperature correlation data indicate that vitamin retentions are essentially the same under constant and fluctuating storage temperatures.

Because of the considerable differences in rate of loss of the several vitamins from the variety of canned products studied, it is difficult to draw any generalizations from these studies as to their relative stability. It has been shown that in bottles or enamel-lined cans, ascorbic acid is lost much more rapidly when considerable amounts of oxygen are present than when the headspace contains little oxygen (Tressler and Curran) (15). However, when acid products are packed in plain tin cans, a reducing condition is obtained which retards the rate of loss of this vitamin (Feaster, Tompkins and Pearce) (4).

Sheft, Griswold, Tarlowsky, and Halliday (13) studied the effect of time and temperature of storage (50°, 65°, and 80° F.) on ascorbic acid, carotene, niacin, riboflavin and thiamin content of commercially canned fruits and fruit juices reporting that elevated storage temperatures (e.g., 80° F.) accelerated losses of ascorbic acid, and thiamin more than extended storage periods. Losses of carotene and ascorbic acid were higher in tomatoes than in tomato juice. Brenner, Wodicka, and Dunlop (2) in a study of the rate of loss of vitamins from army ration items also found that the losses of ascorbic acid and thiamin were more serious than those of the other vitamins studied. Freed, Brenner and Wodicka (5) also studied the stability of the thiamin and ascorbic acid content of "representative" canned foods (apricots, orange juice, tomato juice, peas, spinach, green beans, and lima beans) stored at 70°, 90°, and 100° F. and worked out nomographs from which the probable rate of loss of these vitamins from these foods could be predicted for any given average warehouse temperature.

Few workers have attempted to correlate vitamin content and accepta-

FIGURE I

Some Changes in Apricots during Storage

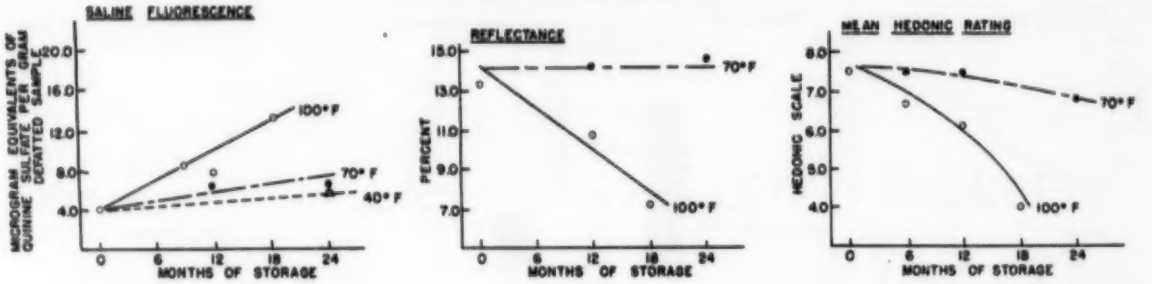
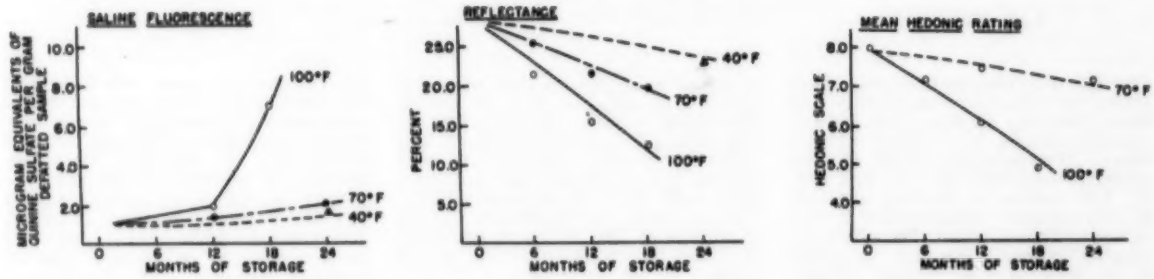



FIGURE II

Criteria of Stability in Canned Peaches




bility of the stored canned product. However, studies on frozen foods have indicated a close correlation between the relative ascorbic acid content of any given vegetable or fruit and the acceptability of the product, assuming that the product has no particularly undesirable off-flavor (Tressler) (14). In general, it can be stated that while vitamin content is only one index of many indices of quality of canned foods, a great loss of vitamin content is usually accompanied by a somewhat similar loss in acceptability. The flavors of some foods, e.g., orange juice, are quite sensitive to storage (Feaster, Tompkins, and Pearce) (4), whereas others, e.g., sweet potatoes, are relatively stable.

### Needs of Armed Forces

The armed forces have a great interest in the keeping quantities of the foods which compose the rations. The necessity for stockpiling in sufficient quantity to meet emergencies and the practice of keeping long supply lines full place a premium on the quality known as stability or lack of serious deterioration or change from initial quality.

Studies conducted at the Quartermaster Food and Container Institute

FIGURE III

Chemical and Sensory Changes in Canned Sweet Potatoes

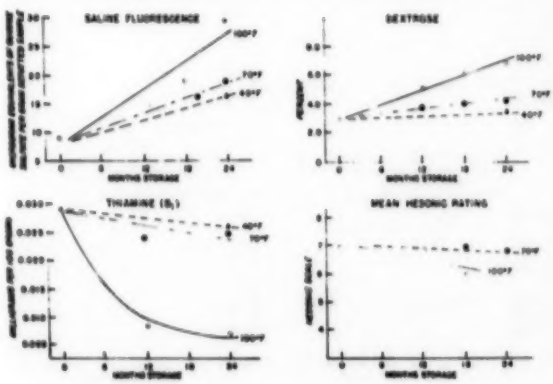



FIGURE IV

Effect of Low Storage Temperature on Preventing Deterioration of Cheese Spread

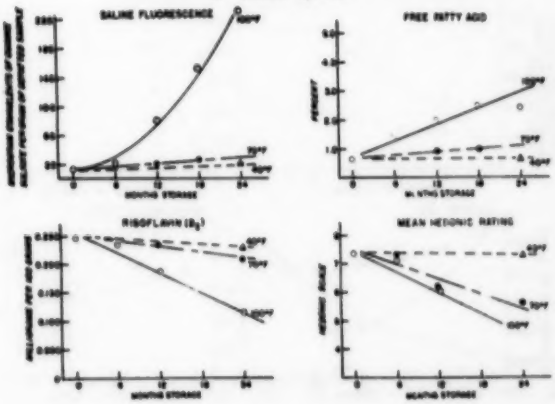


**FIGURE V**

**Some of the Changes in Evaporated Milk during Storage**

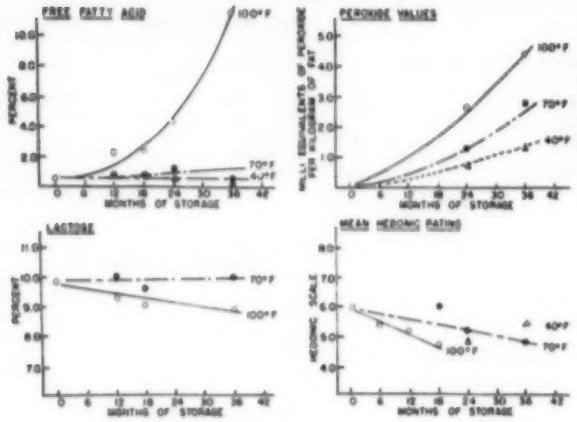
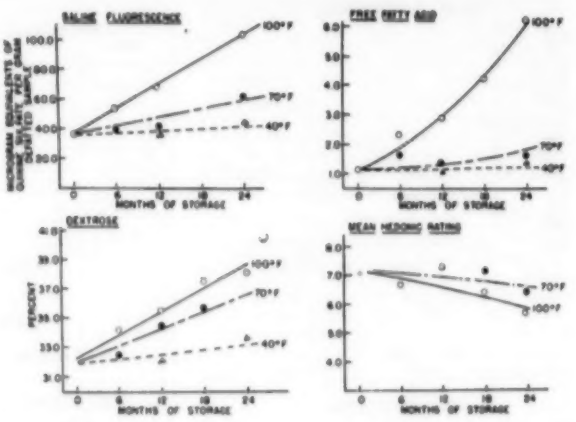



**FIGURE VI**

**Some Changes in Canned Date Pudding during Storage**




over the last three or four years have shown the effect of temperature and time of storage on some chemical and sensory changes in a variety of food items. Temperatures used in this research have been 40°, 70°, and 100° F. Information on keeping qualities at intermediate temperatures is obtained by interpolation. Data on some selected canned foods are presented in the accompanying figures. Whenever data are not shown for 40° F. storage, the product may be assumed to have remained virtually unchanged throughout the storage period.

When canned apricots (Figure I) were stored for two years, changes in acceptability of the product at 100° F. were rapid, while at 70° F. little change occurred, and at 40° F. the product appeared to be unchanged. Acceptability was measured in terms of a nine point hedonic scale by a consumer type panel of 30 to 40 people. The mean hedonic rating is shown. The objective tests of reflectance and saline fluorescence, indications of color change and browning, may be correlated with decreases in acceptability. The cans were swollen after 24 months of storage at 100° F. due to hydrogen produced by corrosion action of the product on the containers.

Very much the same picture developed on storage of canned peaches (Figure II).

Some of the changes which occurred in canned sweet potatoes are shown in Figure III. Pronounced thiamin loss and decline in acceptability during 100° F. storage are apparent as is also the increase in saline fluorescence which is usually related to the browning reaction. Deterioration of the physical structure was very definite after three years' storage at this temperature. Also noted was a very definite increase in dextrose content during 100° F. storage. This may result from inversion of sucrose.

With canned cheese spread (Figure IV) 40° F. storage prevented serious deterioration during two years of storage, but 100° F. storage resulted in sharp increases in free fatty acid values and browning (saline fluorescence), while both 70° F. and 100° F. storage brought about rapid declines in acceptability.

Some of the changes occurring in evaporated milk are presented in Figure V. It is obvious that many changes occurred simultaneously. Those shown are in free fatty acid content, peroxide values, lactose content and acceptability. Corrosion of

**FIGURE VII**

**Chemical and Sensory Changes in Canned Bread**

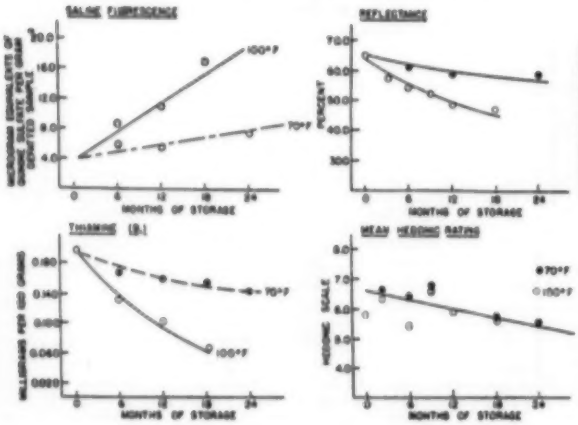



**FIGURE IX**

**Fat Hydrolysis and Other Changes Noted in Hamburgers and Gravy during Storage**

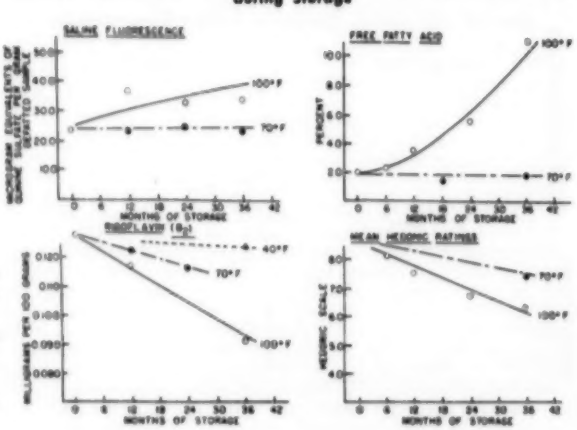
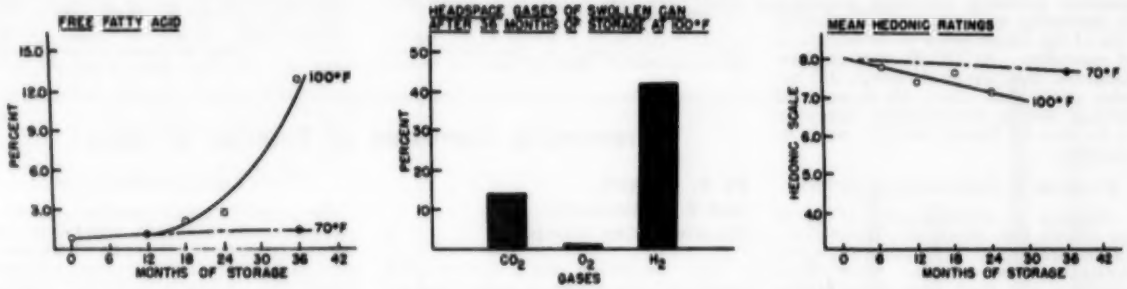


FIGURE VIII

Swelling of Cans of Beef and Gravy Caused Failure between Two and Three Years of Storage at 100° F.




the cans during prolonged storage was a serious problem which was aggravated with increasing temperature. It is obvious that lowering the temperature held these changes at a minimum. Peroxide values shown bear a relationship to changes in acceptability.

Results obtained on storage of canned date pudding are presented in Figure VI. This product is rather stable as indicated by changes in acceptability, but results of chemical analyses show that fat hydrolysis, browning, and inversion of sucrose occurred at an appreciable rate during storage at 100° F.

Another of the items in our rations is canned bread. Stability is good (Figure VII), and there was little difference in acceptability during 18 months of storage at 70° F. as compared with 100° F.; however, results of chemical tests show that thiamin loss and browning took place much more rapidly at 100° F. than at 70° F. Storage at 40° F. further reduced the rate of these changes.

With canned meat products, storage studies have shown that a considerable variation in stability characteristics is to be expected. Figure VIII illustrates some changes which occurred in canned beef and gravy during storage. Little change in acceptability occurred during two years' storage at 100° F.; however, chemical changes did take place during this period, one result being high free fatty acid values and severe corrosion of cans. The latter is best illustrated by citing the swelling of cans in 100° F. storage after two years' storage. Analysis of headspace gases showed the presence of over 40 percent hydrogen.

Figure IX indicates that in hamburgers and gravy some of the predominant chemical changes are fat hydrolysis and loss of riboflavin during storage at elevated temperatures. This product remained in an acceptable condition for approximately two years at 100° F. and four years at 70° F.

Canned bacon (Figure X) is not as stable as many of the other canned meats used in the rations. A deterioration in physical qualities occurred on storage at 100° F. This was quite definite at 6 months and had progressed to the extent that it was impossible to separate the slices at the end of 12 months' storage. The samples stored at 70° F. were quite acceptable for 18 months, but between 18 and 24 months of storage at this temperature a rapid decline in acceptability occurred. Peroxide values indicate that oxidation occurred at similar rates at both 70° and 100° F., while the rate of formation of free fatty acids and saline fluorescence was appreciably faster at 100° F. than at

FIGURE X

Several Types of Deterioration of Canned Bacon during Storage

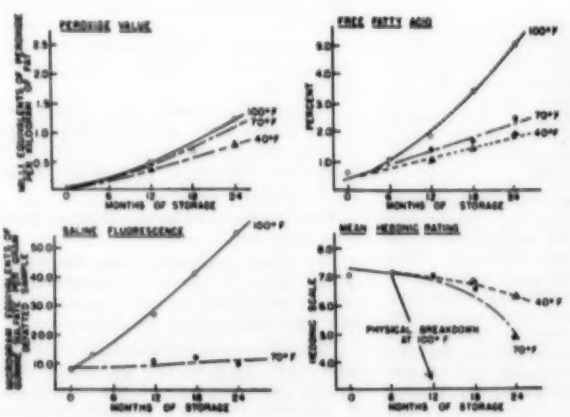
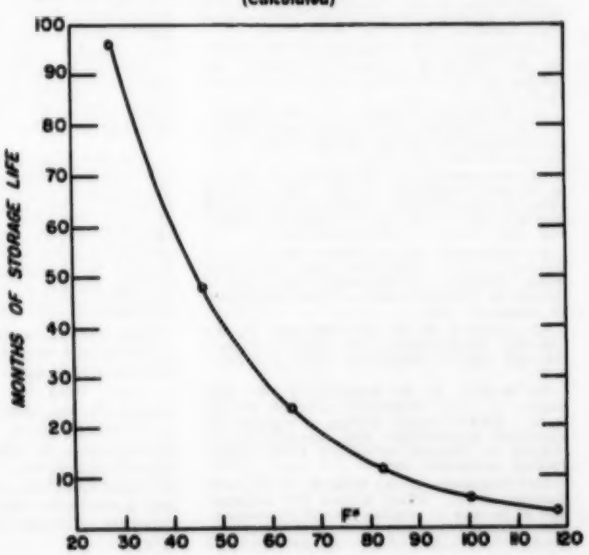



FIGURE XI

Relation of Temperature to Storage Life of Ration Item "X" (Calculated)



70° F. The cause of deterioration in this product appears to be twofold. At 100° F. storage temperature, a deterioration in cellular structural proteins probably occurred, resulting in softening and physical disintegration of the bacon prior to development of rancidity. At 70° F. storage temperature, this physical change did not take place, but after 18 months of storage loss in acceptability appeared to be due to flavor defects, such as rancidity.

### Measure of Temperature Effect

Changes in acceptability of foods are chiefly the result of chemical reactions leading to different flavor and physical characteristics. That these reactions are time and temperature dependent is obvious from much work reported in the literature and from the data presented here. The rates of many of these reactions more than double for each 18° F. rise in temperature. Figure XI shows the calculated storage life in months of a canned food having a shelf life of six months at 100° F., for which the rate of deterioration doubles for each 18° F. increase in temperature. This generalization serves to illustrate the effect of cool storage on reduction of the rates of reactions concerned in vitamin losses, browning, pigment changes, fat and carbohydrate hydrolysis, corrosion and other reactions concerned in deterioration of canned foods. Minimizing such reactions protects food quality and extends shelf life.

### References


(1) Beattie, H. C., Wheeler, K. A., and Pederson, C. S., "Changes occurring in fruit juices during storage," *Food Research 5*, 395-404, 1943

(2) Brenner, S., Wodicka, V. O., and Dunlop, S. G., "Effect of high temperature storage on the retention of nutrients in canned foods," *Food Technol. 2*, 207-221, 1948

(3) Clifcorn, L. E., "Factors influencing the vitamin content of canned foods," *Advances in Food Research*, Vol. I, pp. 39-104, 1948

(4) Fenster, J. F., Tompkins, M. D., Pearce, W. E., "Effect of storage on vitamins and quality in canned foods," *Food Research 14*, 25-39, 1949

(5) Freed, M., Brenner, S., and Wodicka, V. O., "Prediction of thiamin and ascorbic acid stability in stored canned foods," *Food Technol. 3*, 148-151, 1944

(6) Guerrant, N. B., Fardig, O. B., Vavich, M. G., and Ellenberger, H. E., "The nutritive value of canned foods. Influence of temperature and time of storage on vitamin content," *Ind. Eng. Chem. 40*, 2258-2263, 1948

(7) Guerrant, N. B., Vavich, M. G., and Dutcher, R. A., "Nutritive value of canned foods. Influence of temperature and time of storage on vitamin contents," *Ind. Eng. Chem. 37*, 1240-1243, 1945

(8) Kohman, E. F., and Sanborn, N. H., "Storage temperatures for canned fruits," National Canners Association, *Bull. 23-L Rev.*, 1939

(9) Monroe, K. H., Brighton, K. W., and Bendix, G. H., "Nutritive value of canned foods. XXVIII Some studies of commercial warehouse temperatures with reference to the stability of vitamins in canned foods," *Food Technol. 3*, 292-299, 1949

(10) Moschette, D. S., Hinman, W. F., and Halliday, E. G., "Effect of time and temperature of storage on vitamin content of commercially canned fruits and fruit juices (stored 12 months)," *Ind. Eng. Chem. 39*, 994-999, 1947

(11) *Canned Foods in Human Nutrition*, National Canners Association, Washington, D. C., 1950

(12) Pederson, C. S., Beattie, H. G. and Stotz, E. H., "Deterioration of processed fruit juices," New York S. Agr. Expt. Station *Bull. No. 728*, 1947

(13) Sheft, R. B., Griswold, R. M., Tarlowsky, E. and Halliday, E. G., "The nutritive value of canned foods. Effect of time and temperature of storage on vitamin content of commercially canned fruits and fruit juices (stored 18 and 24 months)," *Ind. Eng. Chem. 41*, 144-145, 1949

(14) Tressler, D. K., "Bacteria, enzymes and vitamins—Indices of quality in frozen vegetables," *Refrig. Eng. 38*, 319-321, 1939

(15) Tressler, D. K., and Curran, K. M., "The cause of loss of vitamin C from bottled tomato just," *J. Home Econ. 30*, 487-488, 1938


## Preventing Corrosion of Exterior of Cans


**By A. R. Beall and E. V. Cassady, American Can Company**


The possibility that the world's supply of tin might at some time be curtailed has caused the canning industry to reduce the use of tin and adopt for many products, containers made of electrolytic tin plate with a tin coating as low as one-quarter pound per base box. Further, these containers in most instances have no outside protection other than the plain electrolytic No. 25 coating, but commercial experience has demonstrated that they have adequate resistance to outside corrosion when a few simple basic rules are followed in handling and storage.

Any tin plate, whether 1.50 lb. hot dip or No. 25 electrolytic, will show the formation of iron rust if exposed to moisture and air for any length of time. Although the No. 25 electrolytic coating has considerably less tin than the 1.50 lb. hot dipped coating, the former will give good commercial service if not exposed to adverse processing or storage conditions conducive to rust formation.

Retorts must be well vented, boiler carry-over should be minimized, and containers should be cooled only enough so that they will dry almost completely after the cooling operation and before casing and warehousing. Dry storage conditions should be maintained continuously for the filled cans. None of these requirements are unusual since all are considered good canning practice.

The financial benefit in using No. 25 electrolytic plate containers is well worth while to all those able to employ packing methods which allow its use. Unfortunately, some packers may operate under conditions that cannot readily be overcome, such as corrosive cooling water, so they cannot take advantage of this saving.

The extensive use of lighter electrolytic tin coatings for cans for civilian trade has led to further tests on their uses for the military. The armed forces, during and subsequent to World War II, could not take full advantage of substitutes for hot dipped tin plate, because inadequate information was available on the interior corrosion service life and on the exterior rust resistance of such containers.

### Tests for Military Use

An experimental program was designed to provide data regarding external rusting of all types of tin conservation cans, under normal storage conditions characteristic of worldwide military usage under times of emergency. This program has been executed by the Research Committee of the Can Manufacturers Institute and the Chemicals and Plastics Division of the Office of the Quartermaster General of the United States Army. Howard R. Smith of the National Canners Association served informally as a consultant to the committee. The results of these tests have been most interesting.

Three styles of containers were chosen to exemplify Quartermaster procurement of cans. These were:

(1) Processed cans, as used for fruits, meats, and vegetables.

(2) Vacuum key open style, as used for dry rations, peanuts, etc.

(3) Oblong cans with screw type nozzle and cap, as used for gun oil, insecticides, etc., often called insecticide cans.

No. 25 and No. 50 electrolytic and 1.25 lb. hot dipped tin plates were selected to represent the range commercially employed in 1950 in can making. Also included were can manufacturing quality black plate (CMQ) and chemically treated steel (CTS) (Bonderite K, process), both of which were widely used for civilian cans in World War II.

Can manufacturing quality black plate (CMQ) was not included in processed cans as no organic coatings were then available which would satisfactorily adhere to this plate during processing.

Chemically treated steel (CTS) and CMQ plates were not included in the oblong cans because of difficulties in soldering this style can when made from tin-free plates.

Two kinds of exterior organic coatings were employed:

(1) That applied to the flat sheet of tin plate by the can manufacturer before fabricating into cans. This has been designated as precoating.

Phenolic resin formulation precoatings were used on the processed and oblong cans because of the resistance of phenolic coatings to both process-

ing procedures and to solvent packed in the oblong cans.

Alkyd formulation precoatings were employed on the key open cans as no processes were involved and the thicker alkyd film was expected to offer maximum protection.

(2) That applied after the can was filled, closed and processed. This was applied by the canner during World War II, and was known as procoating. During the term of these tests this term was changed to postcoating, and will be referred to as such.

Both alkyd and non-alkyd type postcoatings were employed to encompass a range of non-critical raw materials.

The postcoatings were applied by the dip method on round cans and by electrostatic spray on the oblong insecticide style cans.

All coatings were pigmented olive drab except precoating on CTS and CMQ plates which were later postcoated. It was necessary to precoat these lots to prevent rusting before packing and postcoating.

Outside side seam stripes were applied by roller coating on the following:

(1) All CMQ, and CTS postcoated key open cans.

(2) All precoated key open cans.

(3) Precoated CTS processed cans.

The processed cans were packed with a starch solution in a cannery under commercial conditions. The key open cans were vacuum packed with dry peas in a cannery. The insecticide cans were packed with a kerosene type naphtha in a paint plant.

The can variables of the same style of manufacture were staggered in sleeved and strapped V-2 cases so that every variable of plate and exterior coating occupied every position in the case. Cases were palletized at the Quartermaster Depot at Jeffersonville, Ind.

### Exposure Conditions

The office of the Quartermaster general arranged for outdoor exposure to typify world-wide climatic conditions as follows:

(1) Temperate at Fort Lee, Va.

(2) Desert at El Centro, Calif.

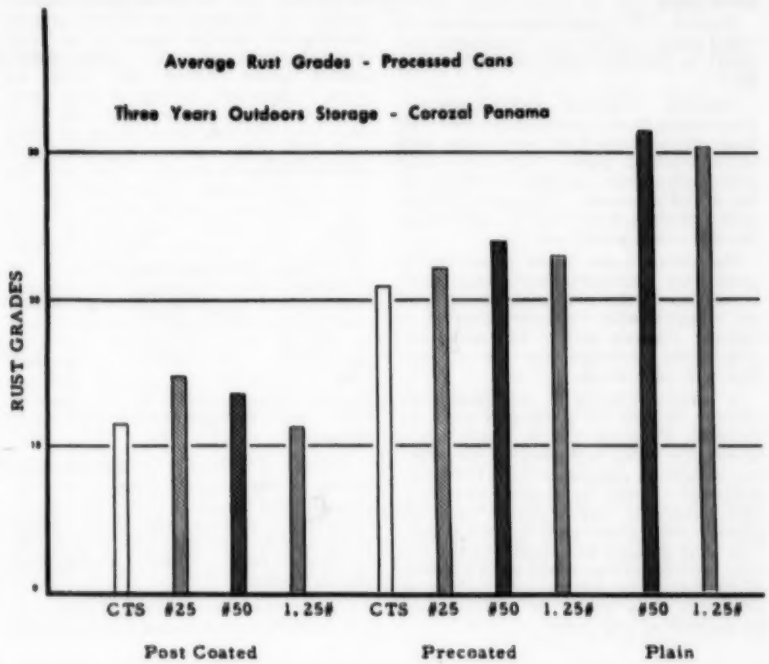
(3) Arctic at Big Delta, Alaska.

(4) Tropic at Corozal, Panama Canal Zone.

Maywood, Ill., was included as a fifth site so that storage in a temperate area with moderately severe winters and warm summers could be included.

Cased cans were also subjected to accelerated test storage in the Quartermaster Food and Container Institute, in a tropic humidity room and a desert cycle heat room. Salt spray testing and refrigeration cycle tests on uncased cans were conducted at the American Can Company, Maywood, Ill., Laboratory.

FIGURE 1




The cans were examined soon after receipt at each test site and periodically thereafter for the first two years and again at the end of the third year at all sites except El Centro, Calif. Because of very limited effect by desert storage, examinations at this site were terminated after two years.

At each examination previously unopened cases of cans were employed. Approximately 48 cans per variable were examined visually and graded for rust, according to a pre-established written rating procedure and also in accordance with colored photographic standards prepared by the committee. Puncture vacuum readings were made on the processed and key open style cans.

It should be emphasized that great care was exercised throughout the test to insure commercial handling during manufacture and packing, typical Army handling during shipping and storing. Cans were staggered in cases and cases staggered on pallets to provide equal exposure conditions on cans. Examining teams were alternated at test sites so all teams would rate cans at all test sites so as to avoid human error as much as possible.

The reduction of so great a mass of detailed data into a series of lucid statements of "results and conclusions" was a long and difficult task. The committee devoted many hours to derive the statements regarding the external rusting of cans made from tin and tin free plates. These statements are not to be construed as necessarily reflecting either the views or endorsement of the "Department of Defense."

### Effects of Storage

*Vacuum Retention and Perforations* —No loss of vacuum, perforation, or other spoilage attributable to exterior rusting was found at any site except the one in the Panama Canal Zone after three years' exposure. Rust formed during storage in cases was only superficial and did not tend to pit through the steel plate except at Panama. During the third year of storage at the Panama site, the infestation by insects in the bottom layer of cans in the bottom cases on the pallets became so severe as to cause perforations of a few cans from rust, initiated by excreta of the insects. This occurred on both coated and plain cans.

*Plate Performance* — Rusting decreased slightly with increased tin coating weights, but organic coatings exhibited a much greater protective effect than did the heaviest tin coating weights. (Initial observation of this was reported in W. J. Mutschler's paper, "Performance of 0.25 Pound Electrolytic Tinplate on Cans for Processed Food Products," N.C.A. Information Letter No. 1426, Feb. 28, 1953, page 67, which included information from the early phases of this test.)

Precoated and postcoated No. 25 electrolytic tin plate cans were more

rust resistant than plain hot dipped plate cans.

Coated CTS plate was superior to CMQ plate and in many instances was equal to tin-plate cans in rust resistance.

*Organic Coating Performance*—Postcoated cans showed much less rust than did precoated or plain cans with corresponding plate. The non-alkyd postcoating was slightly superior to the alkyd material. The electrostatic spray method was slightly superior to the dip coating method.

Precoated cans were considerably more rust resistant than plain cans. Scratches in the organic coatings did not appreciably reduce protection against rusting unless the scratches penetrated through the tin coating into the base steel.

A graph Figure I, of three-year storage results on processed cans at Corozal, Panama Canal Zone, illustrates the small influence of tin coating weight as compared with the large influence exerted by organic coatings. The favorable performance of CTS plate is well illustrated in this graph. The rust grades are total grades for nine individual can areas with a grade of 90 indicating 100 percent failure of all areas or a grade of 0 indicating no failure of any area.

*Distribution of Rust on Can Areas*—Except for the three-year examination at Panama the following generalization can be made as to "rust prone" areas on cans. Top double seams (ends stored up) were the area of greatest rusting on most cans. The plain caps of the insecticide style cans and the side seam areas of CMQ and CTS plate vacuum key open cans showed greater rusting than did the top double seams. (Improved soldering techniques, use of cemented side seams and other technological advances would indicate the probability of less rust on side seam areas of the tin-free cans manufactured today.) Top ends of plain cans showed considerable rust, especially top ends of cans in the top layer of the top cases on the pallet. Side seams on tinplate cans even when not striped, did not appear greatly rusted, thus indicating little need for specifying side seam stripes.

*Effect of Storage Climate*—Cans stored in the tropical climate of Panama showed the most rust. The arctic climate of Alaska was more severe in its effects than that observed in the temperate zone. Desert storage had the least effect.

*Accelerated Test Results*—The tropical humidity room test correlated well with actual tropic exposure and was the best accelerated test employed.

The rate of rust in cans in the cycle heat test was slow, although correlation with desert exposure results was good.

Salt spray test results at 100 and 200 hours did not correlate with exposure results, indicating this is not a satisfactory method for evaluating resistance to rusting.

The cycle freezing test failed to produce rusting, so was of no benefit.

### Conclusions

Commercial experience has proved that most packers can use plain No. 25 electrolytic plate cans for civilian markets without experiencing external corrosion problems. These tests reported herein have again demonstrated that the thickness of the tin coating has only a slight effect in prevention of rust and that the military can use light tin coatings on cans without loss of product due to perforations from rusting, and should experience only superficial rust in cases under severe storage conditions. Where storage may be especially severe, such as prolonged tropical storage, postcoating affords maximum protection.

# QUALITY GRADING AND WASHING

(sponsored jointly by N.C.A. and C.M.&S.A.)

Presiding: Roger Lueck, American Can Company, New York

Panel members: F. S. Langsenkamp, Jr., F. H. Langsenkamp Co., Indianapolis; W. N. Hughes, Chisholm-Ryder Co., Columbus, Wis.; Harvey A. Scheel, Green Giant Co., Le Sueur, Minn.; Allan Warehime, Hanover Canning Co., Hanover, Pa.

Panel Discussion: "Quality Grading"

Discussion leaders: Harold L. Link, Food Machinery & Chemical Corp., Hoopeston, Ill.; Leonard Berth, The Larsen Company, Green Bay, Wis.

Panel Discussion: "Washing"

Discussion leaders: Francis Miller, Key Equipment Company, Milton-Freewater, Ore.; R. G. Thomas, Illinois Canning Co., Hoopeston, Ill.

Address: "Spoilage Prevention Aspects of Quality Grading and Washing"—C. Wallace Bohrer, Washington Research Laboratory, N.C.A., Washington, D. C.

## Quality Grading

**By Harold L. Link,**
**Food Machinery &**
**Chemical Corporation**

"Quality Grading" is a very broad subject. In order to make it fit this program, it will be limited to quality grading by specific gravity separators and, limited still further, to the specific gravity separation of peas.

My report concerns itself primarily with the theory, mechanical details and mechanical performance of quality graders for peas and the extent to which quality graders are being used by the pea processing industry. Some of the present information is derived from a confidential survey just completed among Wisconsin pea canners. A total of 50 plants with 141 pea lines using 87 quality graders responded promptly to my urgent request for help. I acknowledge this assistance most gratefully.

### The Theory—How Gravity Separators Work

The desire to select the good from the bad, or the better from the poor, is age-old. It started in the Garden of Eden. For all the trouble Eve started, we can only trust that she picked the best apple off the tree.

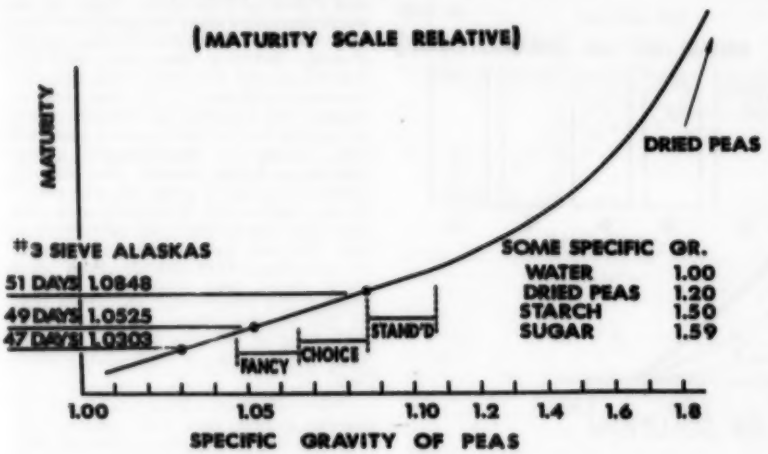
The matter of picking the better from the poorer grades of peas becomes essentially a matter of selecting the desired maturity. It is not easy to choose a measurable property of peas which changes in a direct manner with maturity.

Twelve characteristics of the maturity of peas have been measured over the last 25 years, none of which is an entirely satisfactory or completely dependable criterion of quality.

During the late twenties and 1930's, interested research people and progressive-minded canners turned to the

FIGURE I

Relationship of Maturity to Specific Gravity of Peas




segregation based on specific gravities as a means of improving the quality of the finished product. Figure I is based on the early specific gravity work. It shows a general relationship between maturity and specific gravity. Notice that the maturity scale is relative. This is a composite curve made from the work of Dr. Strasburger (reported in *The Canning Trade*, 1935); Dr. Walls (University of Maryland, 1937); and Mr. Jodidi (*Food Industries*, 1937, and *The Canning Trade*, 1939 and 1940).

The maturity scale could well read "days from planting" or "tenderometer readings" or "alcohol insoluble solids" or "decreasing moisture."

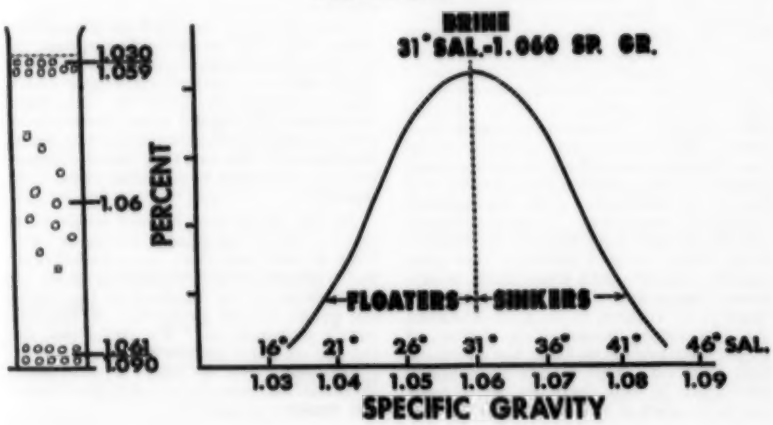
Included on the chart are the specific gravities for water at 1.00, dry peas at 1.20, starch at 1.50 and sugar at 1.59. As the young pea matures, it builds up its concentration of sugar and starch, thereby increasing its specific gravity. It changes in ratio of solids to moisture; this also has the effect of increasing its average specific gravity.

In an example taken from one of the early works, there is shown on Figure I the increase in specific gravity of No. 3 sieve Alaska peas at time intervals of 47, 49 and 51 days from planting. Notice how rapidly the specific gravity changes and that within a matter of two days the maturity can run through Fancy and Extra Standard to the Standard grade.

Figure II is a curve illustrating a typical distribution of specific gravities in a sample of field run peas. This curve is an extension of the previous illustration and shows how peas from a single field being harvested at one time differ in the amount of different maturities.

FIGURE II

Specific Gravity Distribution of Peas
(All Data Relative)




The data of this chart are relative. Some may disagree with the spread of specific gravity from about 1.03 to 1.09, or salometer 16° or 46°. However, there can be no disagreement that there will be a spread of a moderate range for any sample of peas selected. These are the peas that must be separated into useful quality groups in a gravity separator. The complexity of the process of separating them is apparent in this chart. The selection of the brine concentration in the quality grader is intended to determine the percentage of floaters and sinkers in any given lot. In this example, the salometer is set at 31°, which is also the arithmetic mean of this sample. To the right, all the peas should be sinkers, and to the left, all the peas should be floaters. This comparison is illustrated in the cylinder at the left of the curve in which a brine of 1.060, or 31° salometer, is shown separating a small quantity of peas. The peas of specific gravity 1.030 to 1.059 float and the peas from 1.061 to 1.090 sink. The peas at 1.060 should remain stationary in the brine. They actually do momentarily, but due to absorption of salt, they have a tendency to sink eventually.

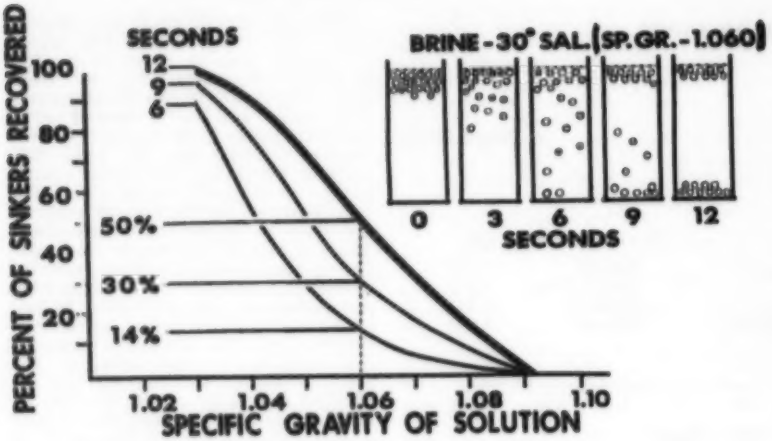
Referring back to the distribution curve, if the selection of brine salometer is less than 31°, for example 28°, then a larger portion of sinkers would be secured. If the salometer were set at 16°, then all the peas should be sinkers. If the salometer were set at 46°, then all the peas should be floaters. The matter of setting the brine concentration on this curve is a subject that Leonard Berth will discuss in more detail.

In the cylinder, we have indicated that the split between floaters and sinkers is 50-50. This is also the basis for the distribution curve. In commercial practice, graders are used when the split is closer to 75 percent or 85 percent floaters. This is for the reason that there is a great deal more dollar value to be gained by quality grading a sample with a high percentage of floaters than with a high percentage of sinkers. The ability of a given brine density to separate peas of differing densities under ideal conditions is affected by many factors. Ideal separation can be achieved only under static conditions not possible in the dynamic action of a commercial quality grader.

### Theory of Quality Graders

The separation of particles based on their differences in specific gravity is known so well that a mathematical equation called Stokes Law describes it. Stokes Law says that the time for a pea to rise or fall in a body of brine is directly proportional to

FIGURE III
Efficiency of Separation vs. Time of Separation
(All Data Relative)




the distance that it must travel. In addition, it says that peas sink faster as the brine becomes increasingly lighter, and the larger the peas, the faster they sink.

Perhaps, like the Prohibition Law, it was meant to be disobeyed. Both peas and quality graders sometimes behave like the bootleggers of the prohibition era. They just don't conform. For that reason, the commercial operation of quality graders has never been put on an exact scientific basis even though the principles involved are well defined.

*Effect of Time*—The effect of time in making a segregation in a quality separator is all-important. An excellent degree of efficiency can be achieved or a poor efficiency can be achieved depending upon the time of the peas in the grader. Figure III illustrates the effect of time on the efficiency of separation. Again, all data in this slide are relative. Consider a sample of 20 peas from the previous slide added to the left cylinder, at zero seconds in 31° brine. Ten peas will eventually end up as floaters and ten peas as sinkers. They will go through the stages indicated in the series of cylinders at 3 seconds, 6 seconds, 9 seconds, and 12 seconds. With adequate time in the brine, in this case 12 seconds, a complete separation of the peas will take place. However, if the time in the quality grader is not adequate, for example 9 seconds, an incomplete separation will take place. A reduction of the time to 6 seconds will result in an even poorer degree of separation.

Referring to the curves on the slide, the upper heavy line designated as 12 seconds shows the percent of sinkers recovered from a sample of peas given the full 12 seconds' treatment in brine concentration, represented along the X axis. In a very real sense, the commercial quality graders on the market today do not start with the peas on the bottom as sinkers. Rather, they start with the peas closer to the floater position; therefore it is necessary that the sinkers have adequate time to fall to their respective sinker positions where they can be discharged properly. In the present example, if a line is drawn upward from the 31° salometer mark, the 6 seconds curve shows that 14 percent of the mixture would be recovered as sinkers. Continuing on with more time, 30 percent of the mixture will be recovered as sinkers at 9 seconds and if the sample is permitted to stand for the full 12 seconds, 50 percent of the sample will be recovered as sinkers.

A problem facing a pea canner who wishes to increase capacity is the effect of increasing the through-put of his quality grader upon its efficiency. After all, every machine has its limits. The separating time can be adjusted by simple manual adjustments of the valves creating a faster brine flow through any of the existing machines. However, less time means less separating efficiency. Similarly, overloading the quality grader by increasing the quantity run through also reduces efficiency. The sinking and floating forces are small and easily offset in an overcrowded chamber. Light peas, which cannot spread apart to let a sinker drop down, will carry out the sinker with the floaters. Likewise, heavy peas in an overloaded quality grader may drag down floaters with them. It is a peculiar fact that quality graders will show their maximum capacity when the ratio of floaters to sinkers is on a 50-50 basis. As the ratio increases in favor of either floaters or sinkers, the capacity will drop off. This is due to a space limitation in that only so many peas can be located in any separating chamber without crowding. It is not possible to "speed up" a quality grader.

*Effect of Specific Gravity of Brine and Effect of Size of the Peas*—It has been remarked that Stokes Law holds that both the difference in the specific gravity between the peas and the brine and also the size of the peas are inversely proportional to the time required for separation. Another way of saying this is that heavier peas will sink faster in increasingly lighter brines, and the larger the pea the faster it sinks or rises. It was shown in the survey of Wisconsin pea canners that the majority of canners sieve size Alaskas and sweets before quality grading. One canner even sieve sizes sweet peas first, then quality grades and recombines the sieve sizes in the proper blend, to achieve the maximum in efficient quality grading. This is good, sound engineering practice.

*Other Factors*—The peas at 1.060 specific gravity will very readily rise and fall depending upon thermal currents or mechanical turbulence of the brine. For that reason, most quality graders are designed to streamline the brine flow to a point where it does not disturb the natural tendencies of the peas to either sink or float.

## The Past

History can sometimes be just a fill-in as it was in my grade school days where it occupied the space between geography of which there was only so much to study, and arithmetic which was always tough-sledding. There is, however, a real point in bringing out the historical aspects of quality grading in this report. It illustrates how relatively new quality grading is to the industry, and reveals the fact that not a great deal more has been achieved from a technological standpoint since its inception.

L. V. Burton in *Food Industries* magazine, in 1938, presented a very excellent review on the subject entitled "Quality Separation by Differences of Density." Many of his statements are true today, some 17 years later.

For example, in 1938 he reported: "One firm will be strongly opposed to its (quality grader) use while another firm will aver that it 'no longer operates successfully without it'. One company will regard it as profitable—even a very profitable operation, while another will declare that quality separation cost more to perform than it is worth."

In the Wisconsin survey made this year a typical non-user comment ran, "We do not feel that the expenditure for equipment and operating costs is equivalent to the increase in the quality grade of the product." A typical user's comment is, "We could not do the job we want done without a quality separation. We estimate a minimum increase in income of $15,000 from one quality grader."

Concepts of economy and efficiency vary quite a bit. I remember Jim McCaulley, a true Scotsman from my college days. He never bought new razor blades since he sharpened the old ones on the inside of water glasses. One year we made a survey just to find out how much he saved. It cost me 95 cents for razor blades and it cost McCaulley $1.05 for water glasses!

Usage of quality graders reached the point in 1944, only ten years ago, that approximately 35 percent of Wisconsin pea canners were using quality graders. In 1949, five years ago, that percentage went up to about 70 percent, where it remains today.

A review of stumbling blocks in the way of further use of quality graders for segregating better quality peas from lower quality peas seem to be (1) lack of factual information about what quality graders could do for a canner; (2) lack of knowledge of the relationship of specific gravity of peas to maturity and, more especially, how it varies from season to season; (3) lack of automatic controls; (4) poor installation permitting salt dilution and salt loss and uneven, non-uniform feeding of peas; (5) lack of information about the basis for setting up selection of brine salometer for a given lot of peas; (6) disagreement over whether supervision of the machine is or is not required, and its relationship to quality in the can; (7) poor results from overloading; (8) an impression that fancy peas could not be sold at a fancy price.

## The Present

The recent survey showed that 72 percent of Wisconsin pea plants use quality graders today. Within the plants that use separators, there are 112 pea lines and 87 quality graders. In an independent survey made by the N.C.A. during 1949-1952, it was found that 73 percent of Midwestern pea plants used quality graders.

The types and manufacturers of graders available to canners are shown in the next three illustrations.

Figure IV shows a cut-away section of the Chisholm-Ryder quality grader. In this grader, peas and brine are added together at the same port in the center of the machine and by a means of "U" shaped spiral trough, peas and brine flow together in a stream to the skimming plate where floaters and sinkers are segregated. Adjustments are available for increasing or decreasing the flow of peas and

FIGURE IV

Chisholm-Ryder Quality Grader

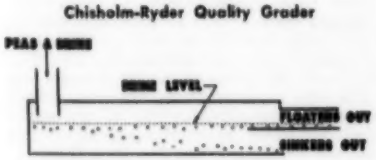
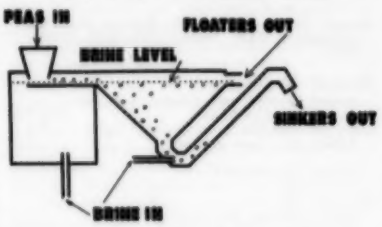



FIGURE V

Olney Straight Line Quality Grader



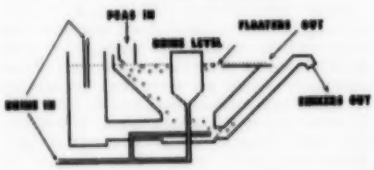

brine through the machine to account for varying and changeable conditions in product flow and requirements of time of segregation.

Figure V is the Olney straight line grader, or the FMC straight line grader. Peas and brine progress in a straight line from the feed and to the discharge end without changing direction. In contrast to the previous grader, the cross-section of the straight line machine is quite large, thus reducing greatly the velocity of the brine. A jet action assists the removal of sinkers from the bottom of the chamber. Again, controls for increasing the flow of brine are available for increasing or decreasing the separation time in the unit proper.

Figure VI is the FMC Lewis quality grader. In cross-section it is not unlike the straight line type. It utilizes a slow-moving body of brine which describes a circular path. Peas are introduced just below the surface of the brine with the floaters remaining on the top and are skimmed off at the discharge end. Sinkers float downward in a rotating motion and are ejected through the sinker port by the jet action of the discharge brine.

FIGURE VI

FMC Lewis Quality Grader




Details of capacity, materials of construction, horsepower and other features of all of these machines are available from their respective manufacturers.

## Present Practices with Quality Graders

*Installation*—Where in the preparation line should the grader be located?

In the Wisconsin survey, the majority of packers of both Alaskas and sweets located the quality grader after the size grader and the blancher. If the blanch is prior to the quality grader, then almost all of the processors cooled down the peas to under 100° F. by means of a flume.

A few packers blanch both before and after separating and this technique is commonly known as preblanching. In this case, the quality grader is located between two blanchers. There are also a few packers who still do not blanch before quality grading but rather blanch afterward.

In the matter of sweets, some of the larger packers blanch, then quality grade, only, eliminating sieve sizing.

Also, the matter of good installation technique requires adequate draining of the peas being fed to the quality grader. The incoming water dilutes the brine and increases the required consumption of salt. In addition, adequate draining of peas from the quality grader is necessary to keep down salt consumption.

*Capacity or Load Factors*—Each grader has been designed by its manufacturer for a fixed maximum capacity. A great many are commonly operated above their maximum at losses in efficiency proportional to the overload. As discussed previously, overload, which reduces the time for separation and crowds the peas, will seriously reduce the efficiency of the quality grading job.

One manufacturer uses the rule of thumb for the capacity of his machine by rating it at one pound of peas per gallon of brine pumped. For example, for a pump of 300 gpm, the capacity of the grader would be 300 pounds of peas per minute. Our results indicate that quality graders are now being used to process from 150 to 300 cans per minute of sinkers and floaters combined. This total production capacity drops off as the ratio of floaters to sinkers deviates from a 50-50 basis.

In addition to the admonition not to overload, there is also another one of maintaining a constant load. If the distribution at the feed end is not uniform, uneven loading or uneven distribution can affect the capacity and performance of your grader.

*Automatic Controls and Accessories*—The ratio of manual to automatic brine makers in use throughout Wisconsin is approximately 50-50. In addition, water softeners are very frequently used to remove calcium so as to prevent hardening of peas later on through its absorption.

Relatively few quality graders are operated today without brine density controllers. All manufacturers of quality graders offer automatic controllers and a very recent automatic recorder-controller has come into some use. This latter instrument is especially useful for permanent records to be maintained in much the same manner as processing records. Operators reported that a normal variation from a present salometer reading is one to three degrees by automatic controllers. Some who are especially careful in-

sist that they can hold it within a plus or minus one-half a degree from their present value with uniform conditions of load and temperature. In addition, simple precautions must be exercised by checking salometers. One laboratory salometer was 4° off in a recent test, and this is not uncommon. Most of this trouble is due to the paper scale slipping from its position inside the salometer bulb.

*Salt Consumption*—It has been reported that some quality graders require higher salometer readings than others for the same degree of separation. The Wisconsin survey report shows 0.15 to 1.00 pounds of salt per case of 303 peas, with an average of 0.71 pounds for all machines. With salt at the low price of 1 to 1½ cents a pound, it is possible to use as much as $300-$400 worth of salt in a quality grader in an average season. A check of good water drainage ahead of the feed and good salt brine removal after the quality grading can cut down on cost.

*Brine Temperature*—A number of harmful effects result from the temperature of the brine getting out of control. First of all, it implies poor control all the way around. Secondly, the changes of specific gravity of peas with temperature are not known, although we do know how the specific gravity of brine changes with temperature, but that alone is not of too much importance. With higher temperatures, foaming becomes excessive and, in fact, it can completely upset quality separation due to the induced turbulence. Increased temperature may accelerate corrosion of your grader. Growth of microorganisms may become excessive if the temperature is allowed to get much above 100° F., not necessarily in the grader itself, but in the peas.

The majority of canners maintain temperature of the incoming peas at below 90°, some even in the 60-70° F. range by using cold, fresh water in the flume between blancher and quality grader. There are some few canners who maintain themostatic controls in the recirculated brine solution so they have it under control at all times.

*Sanitation*—Regular, thorough cleanup is necessary for good sanitation practices and reduction of corrosion in the grader and in the automatic controller.

Manufacturers have had to add guides or fins or shields to streamline the flow in order to prevent turbulence which would upset the natural rise or fall of peas as they should occur. These devices may present some sanitation problems but they should be recognized as being useful and necessary to accomplish the most efficient degree of separation.

*Profit and Loss Statement*—Figure VII is not elaborate; it's very simple and to the point. The Wisconsin survey shows that the average cost per grader per season is $783, which includes cost of depreciation, salt, direct labor, overhead, power and maintenance. In order that there be no disagreement about this figure, let's double it just to save argument; this means that the expenses just described would have been $1,566 per grader per season. So much for the cost.

**FIGURE VII**

**Profit and Loss Statement**

Annual Costs, per Grader, Survey Report Depreciation, Salt, Labor, Overhead, Power = $783

| | |
|---|---|
| Example No. 1: | |
| Added income, per grader, per year | |
| 61,000 cases at $2.70 | $164,700 |
| 4% of $164,700 | 6,588 |
| Added cost, per grader | 1,566 |
| Annual net profit | $ 5,022 |
| Example No. 2: | |
| Added income, per grader, per year | |
| 75,000 cases x 30% x $0.20 | $4,500 |
| Added cost, per grader | 1,566 |
| Annual net profit | $2,934 |

Now, for income. Canners have reported a 4 to 35 percent increase in total income resulting from the use of quality graders. Let's convert some of these percentages to dollars.

In Example No. 1, use is made of the average production per grader of 61,000 cases of 303 peas per season taken from the survey. With an average selling price of $1.35 per dozen, a 4 percent increase in income amounts to $6,588 per grader per year. A 10 percent increase in income amounts to $16,470 per grader per year. These dollar figures are the canners' own reports.

For Example No. 2, one canner increased his Fancy grade Alaskas from 30 to 60 percent by installation of a quality grader. With a 75,000 case pack and a premium of 20 cents per case for Fancies, his additional income was $4,500 per year. At most, his annual costs were $1,566 for a net profit of $2,934 per grader per year.

### The Future

What is the future of quality graders?

Will there be more or less of them in use?

As representative of all the manufacturers, I predict that more quality graders will be sold in the next several years than in the last ten years. These sales will be based on soundly engineered plant layouts to produce top quality peas at the lowest cost. In these days of decreasing profit margins for pea canners, it is the duty of equipment manufacturers to provide the necessary service and machines so that pea processors can earn an adequate return from their capital investments. Normally, it is difficult to justify the purchase of equipment for non-economic improvements in quality alone. When it is possible, however, to show the rapid payoff and tremendous interest on investment reported for quality graders, then purchase of them should be an easy matter to decide.

## Quality Grading

**By Leonard Berth,**
**The Larsen Company**

Most canners, like ourselves, have sought in vain for a fixed formula which may be applied to quality separation techniques. This may seem strange, since the first commercial application of quality separation was applied some 36 years ago, and more specially since an excellent paper on quality separation was made by L. V. Burton some 17 years ago. Probably the most classic comment made in Mr. Burton's paper was, "For anyone to take an arbitrary stand on the debated points (variables in peas) is to ignore a lot of conflicting evidence. It may take years to learn all the facts; on the other hand, it may require less."

If you will run through your own experiences as I have, you can easily list more than 30 variables applicable to the quality separation of peas.

For today's discussion, we shall break down the three major variables. That is, raw product, pre-quality separation, and quality separator itself.

### Product

Classic statisticians throw up their hands in disgust when they must deal with products of nature, whose characteristics are variable and are seldom if ever under the control of man.

The variety itself with which we are dealing, can and does have its own characteristics such as size and density, which must cause us to set up our separators differently for another variety. The maturity of the lot, as well as the relative maturity of the compounded sieve sizes, add a great bearing on our technique. It is no little issue between canners as to what tenderometer grades are worth quality separating. Quality control departments would tell us that if it is not worth quality grading, it is not worth harvesting. They also argue which sieve size need or need not be quality separated. To state dogmatically that 2-sieve earlies or 3-sieve sweets need never be quality graded would be an error of judgment. Viner practices and time from viner to separator should cause us no little concern in the efficiency of separation. Slightly damaged peas, as well as the gas content of the peas must be considered. For the separation is not only based upon the specific gravity of the product but also upon the aerodynamics of the product in motion in a fluid.

### Pre-Separation Procedures

We all know of the gas condition referred to above. It has been long recommended that the only way to eliminate this condition is with blanch. Blanch affects the final end product and at many times is adjusted purely on our desires to obtain certain characteristics which we deem suitable for our label. We must, many times, consider the blanching roll secondary when considering its application to gravity separation.

Let us, however, never underestimate the practicability of blanching with regard to quality grading, despite the fact that some still consider blanching non-functional to separation. We have all experienced opening a can of processed peas, and finding more than a few peas floating near the top of the brine, a large gas bubble encased under the seed coat, and found some of these, not compatible with the desired product grade.

Experience has taught us that blanched peas must be cooled after blanching with fresh, clear water, to a temperature less than 100° F. All too often our quality control departments have shown us that a quality separator permitted to operate at temperatures in excess of 100° have become points of recontaminating with thermophilic organisms. We usually think of the thermophilic range as from 110° to 160° F., with optimum at 130° F. We probably need not consider those organisms which reproduce slowly at 98° F., but which are less heat-resistant than obligate thermophiles.

### Quality Separator

Probably the greatest single factor for poor quality separation is overloading of the quality separation equipment. We cannot long drive our cars 60 miles an hour through a 30-mile zone without paying the penalty; nor can we run 6 tons of peas per hour through a quality separator, capacity of which is 4 tons. The problem of load warrants further thought and discussion. The rated capacity of 8,000 pounds per hour normally is based on a 50-50 separation. At a 70-30 separation the load is reduced to 6,400 pounds an hour. At a 90-10 separation, where probably the greatest majority of separations take place, the load is 4,800 pounds per hour. Too often a canner who finds his separators overloaded will try to adjust the speeding up of the velocity of the brine, by increasing pump size or motor speed, forgetting that the optimum exposure time for separation is from 10 to 18 seconds, depending upon type of quality separator used.

The majority of canners have graduated from the days of adding dry salt, to now, when they are making up concentrated brine in continuous brine of one sort or another. This brine should be made up cold, so that warm brine at the saturated level of concentration, when pumped through pipes where cooling might take place, will become super-saturated, and will plug the pipes. Warming water for brine making at the brine maker increases the efficiency, but very little, in that the solubility curve for sodium chloride is quite flat; only 11⅓ percent more salt can be dissolved in boiling water than in water at 32° F.

We might comment here on the grade of salt used. Some canners use extreme caution in the use of a high-grade, low-calcium salt for their brine in the can, and others will use a crude high-calcium content salt for their brine separators. If one of these practices is right, the other must be wrong. The primary control device for determining the density of the separating brine irrespective of the control mechanisms used is a calibrated salometer. We have found in lot shipments of salometers purchased, the variations in reading as against a standard brine to be plus or minus 2° salometers. We can all visualize what havoc this can play when we may be trying to run two separators exactly alike, and have one 4° salometer different from the other. This will many times answer your question as to why one separator is running at the ratio of 9 to 1, floaters and sinkers, and another at 5 to 1, when all conditions seem to be constant.

### Conclusion

It seems senseless to have a capital investment in equipment, and the outlay of money for crops to be in the hands of inadequate, but more especially poorly-trained personnel at the separator.

Modern industrial methods have taught us the practicibility and soundness of proper indoctrination and training of personnel. We cannot afford not to take the time to explain, show and explain again to our quality separator operators their duties.

Despite any of your pet theories with regard to brine density separation, if you have reasonably good control of brine making, quality separator functional operation including density control, you will in all probability keep up with most of the non-controllable variables by keeping a record log of the tenderometer grades on the various sieve sizes of peas brought in during the season. Compare these with the brine density used, the split obtained and the final product. Better still, with as many variables controlled as possible, make canning samples directly from the quality grader, and check immediately after processing and cooling and adjust your brine density to suit.

## Washing

**By Francis Miller,**
**Key Equipment Company**

Since the beginning of the food processing industry the problem of separating foreign material from sound commodity by washing methods has been of paramount importance. The industry grew so rapidly that the demand for higher quality and lower cost became extremely important.

Management started looking for washing equipment that would meet this challenge. The development was not rapid. However, through trial and error in the last two or three decades many types of washing equipment have been made available to industry, each having had varying degrees of success. Among the more common types are rotary reel washers, spray type washers, flood type washers, riffle type washers, and flotation type washers.

It is to these pieces of equipment that we will endeavor to confine our remarks, bearing in mind that there are advantages and disadvantages to each, due to the varying conditions and products to be handled.

It would be impossible to discuss each separate product and machine in detail in the time allotted; therefore, inasmuch as peas are perhaps the hardest to wash—due to the fact that juices from the vines form a coating which is difficult to remove and which acts as a mucilage for leaves, sticks, splits, and skins—we will refer principally to peas but will digress occasionally to point out certain features applicable to other products.

Many of the vegetable products usually are started with a dry mill, which removes bulk materials, i.e., leaves, sticks, clods, rocks, etc. The principal types are the shaker blower type and the large dry reel type. After removal of as much material as possible, the product then goes to a washer.

*The rotary type reel and spray equipment* is usually a rod or perforated screen reel which revolves in a bath or under a spray, or both, and has an integral spiral for transporting the product through the process. These units do a reasonably good job of removing dirt, juices, and fine particles adhering to the product. However, they are not very effective in removing carry-over pods, sticks, leaves, etc.

*Flood type equipment* is usually employed on such products as asparagus and spinach. They are generally some type of bath or flume with multiple sprays to agitate the solution and products to get the best cleansing action. All such machines have a final fresh water spray rinse and generally do a reasonably good job of cleaning if allowed ample time in the process.

*Riffle type equipment*—This method is usually employed to remove stones, iron particles, etc., and is generally a

sluice box arrangement wherein water and product are passed over the riffle flume to catch the heavy foreign matter, much as is done in sluicing gold.

*Flotation type equipment* is comprised of a bath wherein a sudsing action and selective wetting are developed through injection of air and prepared solution to create a froth or foam which selectively attaches air bubbles to the foreign material, thereby changing its density so that it floats and is removed as trash, whereas the sound product settles in the solution and is removed as good commodity. This method also cleanses the product free from dirt and juices as well as separating splits, skins, etc.

Other types of equipment may be called flotation type. They usually embody a direct-current method for constant circulation, and the specific gravity of the product together with the current effect floats away the light trash, etc. By way of summary, we have not talked about washers in general and it is understood that specific problems will arise which require special attention. These can be dealt with in kind to suit the desired results.

As a result of this cleaning process, whatever the product or the method employed, please remember that we started out to produce a better product, to improve quality and appearance at prices we can afford to pay in these competitive times. Don't lose sight of the fact that these goals go hand in hand with safety of operation for the well-being of our workers as well as the health and welfare of our consumers.

## Washing in the Canning Operation

**By R. G. Thomas,**
**Illinois Canning Company**

All of us know of the importance of washing in the canning operation. We know that the basic reason for washing raw stock is to obtain clean raw material for canning. The net results of proper washing are twofold—namely, the removal of extraneous material from raw stock and the reduction of the incidence of bacterial life on the raw stock which in turn puts a lighter load on the thermal process. These are basic reasons for washing, yet washing is not always done adequately.

Only the other day I was discussing this matter with a friend of mine, a former U. S. District Attorney. What he said concerning canned food seizures definitely pointed to the fact that not all washing is done adequately. I asked him if he had participated in any seizures that were caused by improper washing. He told me that he had taken part in many seizures that resulted because the product contained excessive amounts of extraneous material or soil. Yes, washing is a very important part of the canning operation, and we as canners do have washing problems.

I am not familiar with your experiences along these lines, but perhaps if I were to discuss with you some of my experiences and observations, we might have a profitable overlapping of ideas. It has become very apparent to me over many years in the canning industry that a washing procedure although very satisfactory at one time may be far from adequate the next. This no doubt is a very familiar situation to all of us. We have been canning asparagus, very pleased with the washing operation, and then, during the night, have the heavens let loose. The next morning the snappers would be walking ankle deep in mud. This condition was not an emergency but a normal variation in the day to day life of a canner.

### Typical Operation

Before I discuss what we have done with this "normal variation," I would like to give you a word picture of the asparagus layout at our factory. All of our asparagus is brought to the plant immediately after it is snapped. The asparagus is first cut and then pre-sorted on a conveyor belt which moves it to a water-filled receiving tank. The asparagus travels to the rotary rod washer elevator propelled by agitation created by paddles. The asparagus is spray-washed in the rod washer. Then it is conveyed to another belt for final inspection, spray washing and blanching. We have two counts in our favor: (1) an abundance of potable water and (2) mechanical agitation.

We overflow the receiving tank at all times to remove soluble and insoluble extraneous material. When we are faced with conditions of heavy rainfall such as a "normal variation," we step up this overflow considerably, and, if necessary, produce additional agitation in the receiving tank by increasing the speed of the paddles or by adding more paddles. We have discovered that agitation has proven to be extremely important in rapidly removing adhering soil. We also increse the spray action in the rod washer and, if necessary, use the booster pump installed in our water system to further increase this spray pressure. By manipulating these things, we have always been able to produce a clean raw stock.

One of the most unusual experiences we've had with asparagus occurred during very cold weather last spring. The temperature was close to freezing. The tips of the asparagus became brittle, and at this time it was necessary to use an extremely gentle wash to protect them. Fortunately, this asparagus was quite clean from the field, and we were able to do most of the washing in the receiving tank and to use greatly reduced pressure in the spray washers. Because this happened early in the season, we were thus able to save and pack our highest quality asparagus. If we had not adjusted our procedures to meet this changing condition we would have downgraded this part of our pack. We have learned that we must alter the conditions at hand.

### Riffle Washers

Different products need different techniques. Since we pack many beans and some peas, we've had experience with riffle washers. Just a few years ago we purchased a pea and corn canning plant in Indiana. One of the first steps to be taken by our superintendent to improve the plant was the installation of new riffling equipment. Now he didn't install so many riffles that all of the product was deposited in the riffles, leaving no product to be canned, but he did build enough riffles so that there was no danger of any stones or heavy material in the finished product.

Our riffles are built in troughs 28 inches long containing four baffles to the riffle trough and five troughs to each riffle washer. By using this riffling equipment we have not found stones or other heavy material in either of the last two riffle troughs. The troughs are of course removed periodically for cleaning. A filled riffle cannot remove extraneous material.

The washing of the corn for our cream style pack would no doubt be considered quite conventional. However, we give this corn all of the washing possible. After husking, the corn is pre-inspected. This inspection is followed by a wash in a rod type rotary washer. The corn is inspected and trimmed. Following trimming the corn is again washed in another rod washer. Following this wash the corn is given an additional spray wash and then cut.

### Sources of Ideas

Not only do ideas come from our executive staff, but also from the men in the plant. People who work with equipment day after day often have some excellent suggestions for improving equipment and its operation. To avail ourselves of their experience, we hold conferences with plant personnel to learn their ideas and suggestions in detail. These meetings have helped us to simplify our processes and to make our operations more effective. Recently our entire line was stopped because the peas had clogged a pipe connecting the first inspection belt with the size grader on the second floor. We hammered, pounded, flushed, and swore, but the jam remained until an old-timer simply removed the plug

at the bottom of the pipe and let the peas fall out. This solution hadn't occurred to any of the rest of us.

Many operations, although not specifically washing operations, aid in simplifying, to some extent, the washing operation. As mentioned previously, we do can dried soaked beans. As you all know, these beans have been threshed by combine and contain extraneous material. Some of this material is of low specific gravity and will float on water. In soaking these beans, we fill the stainless steel soaking tanks to the top and then add the raw beans. As each bag of beans is added to the tank, the tank overflows, and this lighter material floats off. Further, we skim the tanks to remove additional lighter material that may come to the surface. You can readily see that this is not washing per se, but it is a valuable aid in removing the lighter, undesirable material. This procedure lessens the load on inspection and naturally insures us a better finished product.

### Special Rod Washers

One of our washing practices which is an aid toward a better finished product results from the use of rod washers with product-tailored rod spacings. These washers precede and follow our blancher. Both reels assist us in quality grading by removing splits and loose skins from the whole beans. The rod spacings were determined by measuring of the diameters of the various bean varieties we pack. Our study of bean diameters showed us that we could not use the rod spacings for navy beans that we use for kidney beans. This is an example of a washing operation which also performs a non-washing function, that of quality grading. Applications of dual functions—in this instance, washing and quality grading—may be made in almost every canning plant. Doubling up means simplification, and simplification points toward efficiency.

Regardless of the type of washer employed in the cleaning operation, there are six basic characteristics we canners need in our washing equipment:

(1) Simplicity of design

(2) Durability

(3) Water and vapor-proof motors of sufficient size to handle overloads.

(4) Direct drive

(5) Construction of non-discoloring materials

(6) Easy cleaning.

Generally, these points are more or less self-explanatory, but something more should be said about design simplicity. Washing equipment is usually an integral part of the canning operation. If a breakdown occurs, it renders the entire system inoperable until the one station is repaired or replaced. Thus simplicity in design—a minimum of moving parts and fine adjustments—can be an important factor in preventing breakdowns of an entire factory.

It must be remembered that the washing, no matter how good, is but a single phase of the total canning operation. Washing is not a substitute for adequate sorting, trimming, and inspection.

By the proper washing of raw material, we decrease the hazard of spoilage. Further, it's been observed that the public eats with its eyes. Unfavorable eye appeal and downgrading of the product can be avoided to some extent by proper washing. Thus, the removal of extraneous material automatically gains repeat sales appeal. Washing of the raw stock should be considered at all times as an important means of producing better canned foods.

## Some Spoilage Prevention Aspects of Washing and Quality Grading Operations

**By C. W. Bohrer,**
**Washington Research Laboratory,**
**National Canners Association**

Since 1926, the bacteriologists of the National Canners Association have been investigating the bacterial populations associated with the preparation and processing of canned foods. The N.C.A. studies have been supplemented by the work of other bacteriologists connected with both the canning and the freezing industries.

A review of the combined findings of these food bacteriologists would lead one to the conclusion that washing can be listed as one of the most important unit operations of the food preparation industry.

From such a statement one might infer that it took a considerable number of bacteriologists a rather long time to arrive at an obvious and self-evident conclusion. However, we are not considering here the readily apparent physical cleanliness produced by the washing of a food product. We are concerned rather with a bacteriological cleanliness which implies the removal of bacteria capable of producing either (1) undesirable quality changes during handling of the product or (2) actual spoilage in the final product.

It was determined very early in the bacteriological investigations that the origin of the bacteria of interest was the soil and that the bacteria were brought into the food preparation plant on the raw product. Subsequently, it was noted that, depending upon the manner in which the product is handled or the equipment maintained, certain bacteria can develop within the canning plant itself. At times, the in-plant bacterial build-up can be a source of spoilage difficulty.

### Typical Corn Operation

Table I shows an example of the total bacterial counts encountered at selected points along a typical whole kernel corn line. The total bacterial count represents the total number of bacteria detectable without regard to their heat resistance. You will note that the initial bacterial load brought into the cannery on the product is markedly reduced in the first washing operation. Subsequently, in the normal travel of the product, contamination is picked up in the cutting and mechanical conveying operations between the initial cob washer and the final product washer. As indicated, this contamination is finally reduced to a satisfactory level by the whole kernel washer ahead of the filler.

The bacterial counts by themselves carry no special significance but they do indicate possible sources of contamination and may be used as an index of washing efficiency or the need of frequent clean-up in certain areas. Excessively high product counts might result in some quality deterioration if the product were held for a considerable period of time under conditions favorable for the development of the contaminating organism, e.g. the holding of No. 1 sieve peas to be run late in the day when the proper filling lines may be available.

The use of chlorine in the wash waters is shown to demonstrate its elect on the total count and to illustrate the fact that chlorine exerts its maximum effectiveness only when it is in intimate contact with the product as in the wash waters. While chlorine aided in reducing the count in the washer, it exerts no direct contamination control in the areas it cannot reach, such as the corn cutters or mechanical conveyors.

The low counts in the line cans—3000 to 4000 organisms—is indicative of the low heat resistance of the "run of the mill" contamination. The

**TABLE I**

**Whole Kernel Corn Line**

| Sample | Total Bacterial Count* per ml | |
|---|---|---|
| | No Chlorine | 40 ppm Chlorine |
| Corn entering cob washer | 700 | 600 |
| Corn leaving cob washer (reel and sprays) | 300 | 40 |
| Whole kernel corn entering washer | 1,100 | 500 |
| Whole kernel corn leaving washer (reel and sprays) | 30 | 40 |
| Corn in line can (hot brine) | 4 | 3 |

* Multiply all counts by 1,000.

**TABLE II**

**Pea Canning Line**

| Sample | Bacterial Counts per ml: Total* | Flat Sour (Thermophilic) |
|---|---|---|
| Peas from viner | 2,300 | 1 |
| Peas leaving Olney washer | 45 | 0 |
| Peas entering blancher | 80 | 0 |
| Blancher water | 0.082 | 30 |
| Washed blanched peas (rod reel washer) | 45 | 0 |
| Peas in line can (unprocessed) | 50 | 0 |
| Thermophilic spoilage (commercially processed cans) | | 0% |

* Multiply total count by 1,000.
Count × 0.37 = bacteria/gm peas.

simple addition of the hot brine reduced their numbers tenfold.

### Examples in Pea Canning

Table II shows a similar bacteriological picture of a pea canning line. Again, you will note (1) the reduction of the initial total count on the raw product by passage through the Olney washer, (2) the pick-up of contamination in the subsequent size grading and mechanical transfer operations. The marked reduction of the count in the blancher water again indicates that the large majority of the bacteria associated with the product are of very low heat resistance and are destroyed by the temperature of the blancher. The total counts on the product following the blanch represent another pick-up of organisms in the conveyors and fillers.

In the same table, the corresponding flat sour count is illustrated. This count represents the heat resistant organisms which may carry thermophilic spoilage potentialities. It is apparent from the data shown that while the spoilage types may be brought into the factory on the raw product the numbers are not great and they are removed in the preliminary washing operations to a point where they are not of direct spoilage significance.

However, it will be noted in the blancher water count that the flat sour types have found haven in the blancher and developed their numbers to a point where they could constitute a spoilage hazard. In the case illustrated, the wash following the blanch was sufficient to eliminate the contamination contributed by the blancher at the time and no spoilage resulted.

**TABLE III**

**Pea Canning Experiment**

| Source of Peas for Canning | Flat Sour Count per can (8 oz.) | Thermophilic Spoilage after Commercial Process* (percent) |
|---|---|---|
| Entering blancher | 0 | 0 |
| Leaving blancher | 378 | 100 |
| Leaving flume | 63 | 58 |

*35 minutes at 240° F.

Table III shows the results of an experiment in which peas entering a blancher, leaving the blancher and after fluming following the blanch were canned separately, given a commercial process, and incubated at 131° F. The results indicate:

(1) The contamination of the peas as they entered the blancher was without spoilage significance in the commercially processed product.

(2) The contamination contributed by the blanchers was sufficient to produce 100 percent spoilage at thermophilic temperatures.

(3) The flume wash after the blanch was insufficient to reduce the contamination to a non-spoilage level.

No data showing the effect of chlorine on the thermophilic flat sour organisms are presented since it has now been well established that the spores of these organisms are extremely resistant to killing by chlorine in quantities practical for use in the canning plant.

### Post-Blanch Washing

Since the washing operations following a point of significant contamination are of prime importance from a spoilage standpoint, it might be of interest to investigate post-blanch washing more closely. In a number of canning plants, peas are discharged directly from the blanchers into a fluming, pumping or bucket conveying system without a preliminary rod reel or shaker wash. This practice introduces blancher contamination directly into the systems and the contamination is carried forward to the line cans.

If salt brine quality graders are in use they serve as immersion washers and gradually accumulate contamination carried over by inadequately washed peas. Eventually this contamination spills over into the line cans. Table IV shows an example of an additive flat sour build-up in quality grader brine. In this instance quality grader No. 4 was receiving the largest volume of peas, and the brine temperature was approximately 25° F. higher than that in the other graders. Any increase in the temperature of the quality grader brine is indicative of inefficiency in the wash after the blanch, and temperature increases of as much as 40° F. have been observed. In this connection, it is well to bear in mind that there is a density loss of 1° Salometer for each 7½° F. increase in the brine temperature and such variations may lead to a poor quality separation.

**TABLE IV**

**Bacteriological Pea Survey**

**Additive Flat Sour Build-up in Quality Grader Brine**

| Quality Grader* | F. S. Spores per 6 ml of Brine: 2 hrs. oper. | 7 hrs. oper. | 13 hrs. oper. |
|---|---|---|---|
| No. 1 | 0 | 8 | 142 |
| No. 2 | 0 | 3 | 19 |
| No. 3 | 0 | 17 | 177 |
| No. 4 | 14 | 42 | 110 |

*Peas flumed from blancher to quality grader. Blancher contamination moderate to high.

### Washing Efficiency

In regard to washing efficiencies, Gillespy (1) of the Fruit and Vegetable Research Station in Campden, England, has reported on some small-scale laboratory tests simulating various washing effects. His tests indicate that a rod reel or shaker wash is about ten times as efficient as a flume wash. He states that "Fluming should be regarded as a good method of removing heavy dirt and as a useful method of transport, but should be followed by a spray wash."

We have observed in our studies under factory conditions that the mere fluming or soaking of the product had no particular advantage in reducing contamination even when the waters used were from a fresh supply. A more pronounced reduction of contamination was the result when the product met with some resistance to flow as in tortuous flumes equipped with water sprays or was jumbled in reel washers under strong sprays of water or forced beneath the surface of the water in paddle type washers.

Mercer (2) of the N.C.A. Western Branch Laboratory described a spray reel which was found satisfactory not only in cooling peas prior to quality grading but also in reducing by 80-90 percent contamination contributed by the blancher. The reel was of rod or wire mesh construction, four to six feet in length, with open end discharge and inclined sufficiently to eliminate the need for spirals. Low volume-high pressure sprays inside the reel delivered 10 to 15 gallons of water per minute.

### Water Re-use Sometimes Possible

While the use of large volumes of washing waters is indicated, some economy can be effected by re-using water counter to the flow of the product. In other words, the waters used in the final wash of the product prior to canning should be fresh and can then be re-used in preceding operations and wasted after the initial wash.

Mercer and York (3) discussed the re-use of water in canning at the 1953 Convention, and their paper covers the application of the counterflow system.

### Difficult Washing Operations

Up to this point, we have considered products relatively easy to wash. Occasionally some extreme washing difficulties, from a bacteriological standpoint, are encountered with

products such as asparagus, mushrooms, and spinach. The soil in which these products, especially spinach and mushrooms, are grown to best advantage may, at times, contain large numbers of the thermophilic heat resistant spoilage types. The elimination of these organisms is definitely a problem because of the nature of the products.

While we have no recommendations at the present time with reference to specific types of washing equipment for these products, we do have general suggestions as to the type of handling they should receive.

Since the raw product as it enters the factory carries a heavy load of both soil and bacteria, the initial wash should be (1) as vigorous as the nature of the product will allow, (2) as rapid as is possible to prevent excessive absorption of the bacteria laden wash water and, (3) in a water volume as small as is practical so that the water can be wasted and replaced continuously to minimize bacterial accumulation. The subsequent washes of the product should embody as many of the previously described agitation features as is possible.

### Bibliography

(1) Gillespy, T. G., "Significance and Control of Initial Infection in Canned Vegetables," *Ann. Report Fruit & Veg. Preservation Sta.*, Campden, England, 1948

(2) Mercer, Walter A. and Townsend, C. T., "Water Re-use in Pea Canneries," *Research Laboratory Report No. 1815-A*, N.C.A. Western Branch Laboratory, Berkeley, Calif., April 15, 1954

(3) Mercer, Walter A. and York, G. K., "Re-use of Water in Canning," N.C.A. Western Branch Laboratory, Berkeley, Calif., Information Letter No. 1426 (Convention Issue), Feb. 28, 1955

# PESTICIDE TOLERANCES

## —Their Effects on Raw Product Procurement and Factory Operation

Presiding: C. H. Mahoney, Director, Raw Products Research Bureau, N.C.A., Washington, D. C.

Address: "How Pesticide Tolerances May Affect the Procurement of Raw Products"—C. E. Palm, Cornell University, Ithaca, N. Y.

Panel Discussion: "Factory Quality Control Aspects of Pesticide Residues"

Discussion leader: D. W. Leeper, H. J. Heinz Co., Pittsburgh

Part I—"Detection of Residues by Biological Assay Techniques"

Panel members: W. M. Hoskins, University of California, Berkeley; F. C. Lamb, N.C.A. Western Branch Laboratory, Berkeley, Calif.; C. J. Tressler, N.C.A. Washington Research Laboratory, Washington, D. C.; J. E. Dewey, Cornell University, Ithaca, N. Y.

Part II—"Effect of Applied Pesticides on Flavor Changes in Canned Foods"—Elly Hinreiner, University of California, Davis

## How Pesticide Tolerances May Affect the Procurement of Raw Products

**By Charles E. Palm,**
**Cornell University**

Pesticide residues have been of concern to processors and producers for the past quarter of a century. The past decade has witnessed an increasing tempo in their importance due to the great number of new chemicals that have entered the pesticide field. It is perhaps easier now to appraise pesticide residues as they may affect the producer, processor, and consumer than was possible during the past few years. Definite legislation, outlining the responsibilities of all concerned with production and processing, has been established under Public Law 518, known to many of us as the Miller bill or Act, which becomes Section 408 of the Food, Drug, and Cosmetic Act of 1938. Further, proposed tolerances for some 26 chemicals have been announced in the *Federal Register* under date of October 20, 1954, based on the hearings held in 1950 for necessity for use of pesticides on fresh fruits and vegetables as provided under Section 406 of the Food, Drug, and Cosmetic Act at that time. It is hoped that final tolerances, or exemption from tolerances, will be announced within the next few weeks, based on these proposals. The signing of the Miller bill by the President on July 22, 1954, provided one year from the date of signature for the effective date of the regulations. Unless an extension beyond this date is granted by the Secretary of Health, Education, and Welfare, we will be subject to the regulations in midseason, 1955. Once the final tolerances are announced based on the 1950 hearing, they will have standing under provisions of the Miller Act. It should be noted, however, that there are also provisions under the Miller Act that enable re-examination of tolerances that have been set in view of new data that may be pertinent to the pesticide under consideration. Obviously this is essential, since the extensive volume of laboratory and field research annually contributes new information that has a bearing on tolerances.

### Consumers Are Protected under Federal Legislation

Existing federal legislation provides the Department of Agriculture and the Department of Health, Education, and Welfare with authority over the movement of pesticides and their residues on fresh fruits and vegetables in interstate commerce. Basically, the legislation is designed to provide the consumers of this country with an abundance of high-quality foods by enabling the grower and processor to use needed pesticides for the control of insects, diseases, weeds and related pests, within limits that are safe to the consumers of the food products. I think it is important to note that it is recognized by all concerned that pesticides are essential to production of essential food commodities, and that, based on scientific data as to the hazard of their residues, if any remain on fresh fruits and vegetables at harvest, the individual chemicals are either exempted from tolerances, or a specific level of maximum residue is established to protect the consumer. Further, provision is made to have the Department of Health, Education, and Welfare enforce these tolerances and to seize any commodities that show residues in excess of the established levels. This legislation gives the consumer greater confidence than ever before that he is able to buy food products with assurance of freedom from harmful residues or contamination by other undesirable materials, such as insect fragments or excessive mold spores. It also provides the pro-

ducer with definite guides to follow in meeting these standards. Heretofore, the unofficial tolerances have been the best that we could follow, but in many instances have not been entirely satisfactory.

### The Pesticide Industry, the Grower and Processor Also Benefit

Under provisions of the Miller Act, the manufacturer of pesticidal chemicals knows the definite procedure to follow in obtaining label acceptance for his product that will be shipped in interstate commerce. The farmer, likewise, will know how to appraise the safety of his spray program in terms of safe residue levels at harvest. In most instances, the grower will need advice from the manufacturer and from his federal and state extension services in developing a spray program for his particular use, to be certain that, if he uses pesticides as suggested, he will have produce at harvest within the safe residue limits. It is apparent that the cooperative effort we have been following in recent years must continue. The principal change is that now we have the legal mechanism for establishing the tolerances along the way, and for enforcing these established "guideposts."

Processors are concerned with obtaining high-quality raw products from their growers. These requirements pose a special problem because the processors must have ample raw products to stay in business. They must be available in quantities and qualities to meet the high standards of the Food and Drug Administration. While the federal law applies equally to merchandise disposed of on the fresh market and to canners, the Food and Drug Administration is not prone to concern itself with contamination of fresh vegetables which is obvious to the consumer and from which she therefore is able to protect herself. Thus cabbage aphid infestation of brussels sprouts which is apparent to the naked eye may not result in any federal action if the sprouts are disposed of on the fresh market; on the other hand, if the sprouts are processed and the aphids are not readily apparent after freezing, the frozen crop may require action by the federal government. In either case, pesticide residue requirements would be the same for sprouts going to the processor or the fresh market trade. The final procedural regulations under the Miller Act which were published in the *Federal Register* of February 4, 1955, state that processed foods manufactured from raw agricultural commodities bearing residues will not be considered illegal (from the standpoint of the poisonous residues) if:

(1) The residues have been removed to the extent possible in good manufacturing practice; and

(2) The concentration of the pesticide residue, in the preserved or processed food when it is ready to eat, is no greater than the tolerance permitted on the raw agricultural commodity.

### Responsibility for Effective, Safe Pest Control Programs Must be Shared

Working with the established information of standards that must be met, how, then, do we share the responsibility for getting quality raw products to the processor?

It should be noted that among other requirements of the Miller Act and the Insecticide, Fungicide and Rodenticide Act of 1947, pesticide formulations available to the growers must have met definite standards of performance in pest control. In other words, the grower is protected against the purchase of worthless pesticides. He has adequate directions for safe use to protect the spray operator. He has, in fact, a pesticide guaranteed by the manufacturer to meet the minimum specifications of the formulation, that will perform effectively and be safe to use if precautions listed are followed. Residue limits at harvest should fall within the limits of tolerance. What more, then, do we need?

We need experience with the specific pesticides in the various areas, and on the several crops for which they may be recommended. Climatic conditions vary, seasonal conditions fluctuate. We need careful experimental work to provide the extension service with a basis for field evaluation of the pesticide in each area of recommended use. Perhaps it is a "double-check," but nevertheless, an important one. Florida growing conditions are different from those in New York, or Wisconsin, or Oregon. It pays to know the story on performance and residues at harvest before recommending a pesticide in a schedule for growers to follow. To fulfill this phase of the responsibility, state, federal and industrial experiment stations, alone or in cooperation with each other, must continue their close relationships in research and extension. And equally important, these agencies must continue a close liaison with the food processing industries to insure a mutual understanding of problems and the position that each must take.

Assuming then that Mr. Smith, the grower, has available to him several suitable pesticides that have been produced and evaluated by industry, label accepted for specific uses by agencies of government, and a spray schedule based on experience from research and extension data within his growing area, what problem remains?

It seems to me that the processing firm contracting for Mr. Smith's crops should work out a definite understanding with him, through its field men, as to what spray program is to be followed and such limitations as the firm may find it necessary to place on the use of particular pesticides. It will always be true that certain new chemicals, although pesticidally effective, may have some restriction in use on processing crops due to established procedures at the factory for checking residue levels on raw products or company policy on their use, due to luck of sufficient experience on quality of the processed commodity, and the like. Whatever limitations may be advanced, the grower and the processor should be in agreement ahead of the season, and any changes in policy during the season should be discussed before there are changes in the spray schedule.

It then becomes a responsibility of the grower to do his job well. Almost without saying, it is evident that correct timing of applications is essential to good pest control.

Proper dosage per acre is likewise important for the same purpose and for assuring safe residue levels at harvest. The grower who ignores the warnings on dosage, interval between the last application and harvest, or who leaves applications of pesticides to hired help that will not assume the proper responsibility, has no one to blame but himself if he cannot market his crop. By the same token, the extension or research worker, the sales representative, or other adviser on selection of pesticides for the grower's program must not go beyond the established procedure in advising farmers to use pesticides on crops for which tolerances have not been established, or label acceptance has not been granted. To do so only invites misuse and possible seizure of the crop. We have had a few examples of misuse of effective pesticides and although good pest control was obtained, the Food and Drug Administration was forced to take action against the crop. Who loses in such instances—the grower, the processor and ultimately the consumer. It is a needless waste, because the grower should be certain before using any pesticide, that it has approval for his particular use.

Then there is the example of the occasional farmer who says in effect, "I don't pay too much attention to all of those rules and regulations. What I want is control. I'll sell my crop all right." From here on out, such a farmer is constantly open to trouble. Or there is the farmer who decides that he had better make a later application to be certain that the crop is free from pests at harvest, and overlooks the danger of excessive residue. Human nature will not change because of the Miller Act, but for those who continue to disregard proper procedures in pest control, there can be little sympathy if their crops are seized at harvest and not permitted to move in channels of commerce.

Responsibility for pest control rests squarely with the manufacturer, the agencies of government that deal with

label acceptance of pesticides, and those that make recommendations for their use to farmers. It rests also with those coordinating an acceptable program between the processor and his contracted growers and, last but not least, with the farmer himself. Pest control is a dynamic business. We have exceptional weapons for effective programs—if they are used responsibly.

### What Does the Label Statement Mean?

At the risk of being called trite, it behooves everyone to read the label statements on pesticide formulations and to adhere to their directions for safe use. A chemical may be recommended for use on carrots, and research shows it to be equally effective on onions. If it is not label accepted for onions, it should not be used. To "take the law into your own hands" is to invite trouble. I feel confident that the Food and Drug Administration plans to fulfill its responsibilities under the new amendment and seize commodities with excessive residues or residues of chemicals on crops for which tolerances have not been adopted.

### Processing Industry Should Check Residues on Its Raw Products

Many of the major processors are checking residue levels on commodities at harvest that have been treated with pesticides during their production. This procedure is a necessary part of quality control and affords the industry with definite information to guide its operations. With inspection of processed foods as a routine operation, it will be of increasing importance for the laboratories of the food processors to make residue analyses a definite part of their program, just as the field operations will make supervision of spray schedules a part of theirs.

### Industry Faces Problem of Examining Labels and Establishing Tolerances

Under the Miller Act, a petition from the organization or individual who has registered an economic poison or made application for a registration under the Federal Insecticide, Fungicide, and Rodenticide Act must be sent to the Secretary of the Department of Health, Education, and Welfare, requesting a tolerance or exemption from tolerance be established for the chemical. The petition will bear the following data: (1) the name, chemical identity, and composition of the pesticide chemical, (2) the amount, frequency, and time of application of the pesticide chemical, (3) full reports of investigations made with respect to the safety of the pesticide chemical, (4) the results of tests on the amount of residue remaining, including a description of the analytical methods used, (5) practicable methods for removing residue which exceeds any proposed tolerance, (6) proposed tolerances for the pesticide chemical if tolerances are proposed, and (7) reasonable grounds in support of the petition. The U. S. Department of Agriculture will certify to the Department of Health, Education, and Welfare, the usefulness of a pesticide and express an opinion whether, when used as directed, the tolerance requested reasonably reflects the probable residues that will remain. It is likely that the Department of Agriculture will not accept label registration of a pesticide whose use may involve a residue in or on food crops until after a tolerance has been established in the above-mentioned procedure.

Provisions are included in the Miller Act for referring a protest over a tolerance to a special advisory committee, to a public hearing and finally, if need be, to the courts for ultimate decision.

Industry has a big job ahead in reviewing the tolerances that will soon be established by the Department of Health, Education, and Welfare for some 26 or more pesticides included in the 1950 hearings. All pesticide labels must be reviewed to be certain that they comply with the requirements of the Miller Act, and tolerances established or exempted not later than July 22, 1955. Unless there is an extension of that date, all pesticides for which tolerances have not been established or exempted should not be used on food crops after that time. It behooves the processors to follow carefully the developments along these lines within the next few months and to be certain that only those pesticides are used in field application to their crops for which tolerances are established or exempted. Growers could get into trouble without realizing the fact that they were using a material that made their crops subject to seizure. The extension services and county agricultural agents must be alert also to this problem.

There is another point of interest regarding residues resulting from the use of pesticide mixtures. A procedure will be established for the determination of residues of a particular class, i.e., chlorinated hydrocarbons, phosphate chemicals, arsenicals, etc. It is likely that the total parts per million of allowable residue, when residues are present from two or more pesticides in the same class, will be subject to definite limitations to avoid a build-up of residues beyond a safe limit.

It seems likely that tolerances will be established on the basis of toxicity of the pesticide to warm blooded animals and the necessary levels essential to control the pest or pests. For example, if a given pesticide is not hazardous to man at residue levels of 10 ppm, but data from field experimentation show that control is attained, leaving residue levels of around 2 ppm, it appears likely that the tolerance will be established around the lower figure, since it seems consistent with the policy of the Food and Drug Administration to keep residues as low as possible consistent with toxicology and pesticidal effectiveness.

Some pesticides, i.e., petroleum oils, rotenone, pyrethrins, many copper compounds, sulfur, and others were exempted from the requirement of tolerances in regulations published in the *Federal Register* of February 4, 1955. On the other hand, pesticides containing mercury, selenium, TEPP, and the like have been proposed for zero tolerances, due to their toxicity hazard.

### Summary of Effects of Pesticide Residues on Raw Products for the Processor

The Miller Act, also known as Section 408 of the Food, Drug, and Cosmetic Act of 1938, provides the consumer, the processor, the grower, research and extension workers of government and industry, with definite guidance on pesticide residues. Furthermore, it appears to offer a workable procedure to get prompt establishment of, or exemption from, tolerances for new pesticides once they have undergone the necessary program of evaluation.

With "guideposts" up, the responsibility for avoiding trouble with pesticide residues lies with the grower, the research and extension services of government and industry, and the food processors. Effective pest control programs can be conducted and the treated commodities stay within the tolerance limits.

Growers must be encouraged constantly to use only those pesticides which have been labeled accepted for use on the commodities to be treated.

Growers must be encouraged to follow directions for safe use and not to "double-up" on dosage or apply later in the season than recommended.

Tolerances, when they are established, will be published in the *Federal Register*. They become a matter of public record and everyone interested will know them.

Those commodities which show objectionable residues for one reason or another will be subject to seizure and should be removed from the market.

We are entering an era when pest control should contribute materially to the production of quality raw products for the processor because at last we have definite, helpful guidance on the problem of pesticide residues. We can use the array of effective new pesticides with confidence as soon as they meet the requirements of existing legislation. Fortunately the farmers of this nation are anxious to do a good job and I have every confidence in their ability to do so.

# Purification of Plant Material and Separation of Insecticides for Bioassay

By W. M. Hoskins,
Dora Schiller and W. R. Erwin,
Department of Entomology and Parasitology, University of California

The use of living organisms, in some cases higher animals, has been established practice for standardizing drugs, vitamins and various plant and animal products for a long time. There was little reason to use such procedures with insecticides prior to DDT, except for standardizing pyrethrum extracts and for a limited amount of screening work such as that which resulted in development of the "Lethane" series of insecticides. The rapid introduction of new toxicants starting about ten years ago without adequate methods for chemical analysis led to much interest in biological responses as a quantitative measure of concentration of toxicant in spray and dust formulations and especially of residual insecticides on foodstuffs.

When we began work in 1948 the situation with respect to residue determination of the newer materials was about as follows. Nonspecific chemical methods such as titration of labile or total chloride with silver nitrate were used for DDT, BHC, and a few other chlorinated hydrocarbons. Certain fairly specific methods were available such as the Schechter-Haller nitration procedure for DDT or DDD and the dye development method for parathion. A number of procedures with insects had been used in screening for new toxicants and presumably could be employed for residue analysis, such as the Peet-Grady large spray chamber which was official for grading pyrethrum fly sprays, and the small spray chamber developed in our laboratory (1). More specifically, the Erlenmeyer flask method with adult flies (2) had been applied to residue analysis. The screening method developed in the laboratory of the Bureau of Entomology and Plant Quarantine at Orlando (3) for rapid testing of candidate chemicals as mosquito larvicides had been tried in numerous laboratories, including our own, for residue determination.

### Development of Housefly Method

We decided to use houseflies and began a study of the best method for exposing them to an extract of the contaminated material. Any large exposure chamber is inefficient in the sense that only a small part of the toxicant on its walls can be contacted by insects confined therein. Hence we endeavored to develop a small test chamber and the so-called "small vial method" for houseflies was the result (4). A benzene or petroleum ether extract of a sample was spread over the interior surface of a shell vial in which 25 adult female *Musca domestica* were confined for an hour. Two kinds of trouble were encountered. Mortalities resulting from a known amount of insecticide (lindane was used in most tests) varied in an unpredictable manner—in fact much more than those caused by a given volume of extract from a contaminated sample. Examination under a microscope showed that no two vials had identical size or distribution of the lindane crystals and examination after a group of flies had been confined in the vials indicated very different degrees of pickup of the crystals. It seemed clear that the greater consistency found with the actual extracts was due to the oils that they contained which aided distribution and pickup of the insecticide. Tests with olive oil, lecithin, glycerol and various mineral oils indicated that addition of .002 ml of a highly refined light oil such as a light Volck grade spray oil in the extract for a vial prevented formation of crystals, gave quite uniform distribution over all the surface and resulted in about 80 percent of the deposit being picked up by the flies. The exact volume was not important as long as the insects did not become obviously smeared. While this simple procedure solved the difficulties with standard dosages and enabled reliable reference mortality lines to be determined, it did not solve the problems arising from extractives from the samples. These varied in physical state from light oils to stiff waxes and had two different effects: the light ones often were toxic in the absence of any insecticide and the heavy ones reduced the effects of known added insecticides.

### Extraction Problems

A rather extensive series of experiments was then made to find the most favorable solvent from the viewpoint of least interference from the accompanying extractives. This did not result in any optimum choice for all kinds of samples since the nature of each determines the best solvent for it. Benzene, which is probably more widely used than any other solvent, takes out more interfering material than petroleum ether or chloroform in most cases. An unexpected result from this work was the finding that with wet samples such as fresh fruits none of these highly water-insoluble solvents used alone is efficient in extracting contaminating insecticides from the tissues. They are satisfactory for recovering added toxicant since it will be dispersed among the tissues rather than actually in them, but even then the official A.O.A.C. directions to shake or roll for five minutes lead to very poor recovery. Apparently the difficulty is that benzene, etc., does not make real contact with aqueous tissue and it is very difficult for the insecticide therein to get to the water-solvent interface and pass through it. An excessive period of agitation doubtless would circumvent the difficulty but it seemed better to secure a homogenous liquid phase by tying up the water with anhydrous sodium sulfate or by adding a water miscible solvent such as alcohol, or in extreme cases by doing both.

After considerable experimenting the following procedure was found to be satisfactory. One part by weight of finely divided sample, one part by volume of solvent and one part by volume of alcohol are shaken together for one hour. If the sample is very wet, anhydrous sodium sulfate is added first in sufficient amount so there is only one liquid phase during the extraction. By this procedure instances have occurred in which up to five times as much residual insecticides has been obtained as with benzene alone. After strongly diluting with water the solvent phase is separated (this need not be quantitative provided the recovered volume is determined). With some kinds of produce bioassay can be done without further treatment of the extract, e.g., canned beans. In general, however, purification was necessary. With highly stable insecticides such as DDT or BHC we used strong sulfuric acid. Attaclay columns were fairly satisfactory with more reactive toxicants. This was the status of our work when the project with the National Canners Association was started in July, 1952.

### N.C.A. Project

Our objective was to develop a procedure applicable to a wide range of produce and insecticides but rapid and simple enough to be done with ordinary apparatus. Accordingly the first experiments were aimed at removing interfering extractives by the simple method of partition between solvents. It had been shown by Jones & Riddick (5) that several insecticides can be transferred from *n*-hexane solution to acetonitrile leaving much of the interfering extractives behind in the hexane. Their method was expanded to the following: petroleum ether extract of green beans (1 gram per ml) containing a known amount of toxicant was shaken with three times that volume of acetonitrile; actually the amounts used were 25 and 75 ml. The acetonitrile was withdrawn, diluted with three volumes of water and 40 ml petroleum ether added. After vigorous shaking the petroleum ether was regained and bioassayed. Ninety percent or higher recovery was obtained with heptachlor, parathion and EPN added at the rate of 0.1 ppm. Aldrin gave erratic results. For the less toxic group, recovery of

methoxychlor, DDT, dilan and rotenone was satisfactory but that for toxaphene and chlordane was erratic and was only slightly improved by double extraction at each of the two steps.

While the acetonitrile extraction eliminates many extractives and is a satisfactory method of purification for some produce such as beans or carrots, it failed badly when tried with canned spinach or sauerkraut. There are noticeable differences in the appearance of the extractives from the two kinds of produce, those from beans or carrots being oily in nature and amounting to about 0.13 percent by weight. On the other hand, the extractives from spinach are solid and amount to about 0.5 percent by weight. These solid substances made a stiff layer in the exposure vials and covered over most of the toxicant thus causing an apparent low recovery.

### Column Techniques

In seeking a way to remove such extractives as those from spinach, the hypothesis was made that these waxes, which are chiefly chemically inert esters and hydrocarbons, should be attracted to a solid surface of similar nature and taken out of a more reactive, i.e., more polar solvent, which would retain the somewhat reactive toxicants. Such a situation would exist in a column composed to higher hydrocarbons through which a solvent such as acetonitrile was passing. An added advantage of acetonitrile was that it could then be diluted and the toxicant recovered in petroleum ether which is convenient for preparing the exposure vials.

This purely hypothetical idea was put to the test using in the first place a 1:1 mixture of finely granulated paraffin plus cellulose powder, the latter being incorporated to prevent lumping when the column was packed. Pure acetonitrile dissolved too much paraffin so the recovered liquid was worse than the original extract. This was corrected by diluting to 60 percent with water. Insecticides were added to spinach extract (1 gram per ml) in petroleum ether by the previously described process, the solvent removed by warming gently and the mixture of extractives and insecticide taken up in a few ml warm acentonitrile. This was diluted to 60 percent acetonitrile and put upon the column, after which additional eluent of this composition was added. Excellent recovery was secured in the first 100 ml with dieldrin, lindane, parathion and heptachlor at 0.1 ppm and of malathion, methoxychlor and chlordane at 1.0 ppm. Aldrin, toxaphene and rotenone gave erratic results. The eluate was light colored and contained only a small fraction of the waxy extractives so it was highly suitable for bioassay. At first it seemed that this column performed well enough to justify extensive work to remove the deficiencies, but it proved to be well nigh impossible to prepare duplicate batches of paraffin-cellulose and columns could seldom be packed in a reproducible manner. Accordingly it was decided to prepare the granules for the column in a different manner.

As mentioned earlier, a considerable amount of cellulose powder or other similar material was necessary to prevent the granules of paraffin from adhering to form large masses of relatively small surface area and low capacity for holding extractives. From the familiar fact that thin layers of many soft or even liquid substances tend to lose their fluidity and behave like solids it was reasoned that covering fine particles of an inert solid with a thin layer of hydrocarbons would give granules which could be packed without adhering and consequently would preserve their large surface area and high holding capacity. A number of solids were dipped into a benzene solution of paraffin and the solvent removed by a warm air stream. Cellulose fibers, silica, sand, magnesium oxide and alumina were tried with unsatisfactory results chiefly because the paraffin adhered poorly, especially to those solids which have high affinity for water, and came through as very small hard particles in the eluting liquid. Addition of petrolatum reduced the brittleness of the covering layer and caused it to adhere better. Among many combinations of paraffin, petrolatum and supporting solid particles the most satisfactory product was made as follows. Five grams paraffin (m.p. 160-165°F.) plus 10 grams white petrolatum are added to 100 ml of a 50:50 benzene-chloroform mixture, warmed slightly if necessary. One hundred grams of chromatographic alumina (80 to 200 mesh) are added and the solvents removed on a steam bath while the mixture is stirred gently. The last traces of benzene must be removed. We do this by spreading the coated powder on a flat plate and blowing warm air over it.

For use in a column, 35 grams of prepared wax-alumina powder are poured into a 20 mm o.d. pyrex tube equipped with a 150 ml reservoir at the top and a supporting sintered glass filter plate and drip tube at the bottom. The tube is tapped to promote uniform packing and a vacuum is also put on it during filling. Then a wad of cotton is placed over the powder and the column is rinsed with 50-100 ml. of the eluent to be used, after which it is ready for the extract from a sample. For convenience, it will hereafter be called a "wax column." From such a column only a very few milligrams of petrolatum are dissolved by 150 ml of 60 percent acetonitrile whereas a solution containing 100-200 milligrams extractives comes through bearing only about 4 milligrams, part of which is the petrolatum just mentioned. It may be noted that while this column is not an efficient pigment remover, much of the pigments dissolved in the original solvent are not taken up during the transfer to acetonitrile and consequently are left in a layer on the cotton plug. The emerging eluent is only moderately colored even in case of spinach extracts.

The most important point of all is whether the various insecticides are quantitatively recovered in eluent from the column, especially in actual extracts from produce. Average results from many tests show that with an extract from 50-60 grams canned spinach the following are recovered at 90-100 percent with 60 percent acetonitrile as eluent: DDT, DDD, methoxychlor, BHC, lindane, chlordane, heptachlor, toxaphene, parathion, malathion, and diazinon; at 70-90 percent, dieldrin and endrin, and at about 65 percent, dilan. Aldrin and isodrin are unique in that they require 70 to 75 percent acetonitrile but then give high recovery.

### Group Separations

Tests with lower concentrations of acetonitrile showed that a further separation into groups is possible by use of 40 percent eluent, for this brought through methoxychlor, BHC, lindane, parathion, malathion and diazinon. Systox may be added to this group but the situation with regard to isomers and activated derivatives is so uncertain that for the time being bioassay for systox cannot be interpreted. There is a very real advantage in separating toxicants into groups prior to bioassay for by itself the method gives no identification except insofar as recognizable behavior patterns may be characteristic of poisoning by certain substances, e.g., the "jitters" due to DDT and homologues.

The members of a group do not pass through the column at the same rate but tend to separate. While it has not proved practical to isolate individual insecticides of a group, doubtless this could be done by use of a long column and very slow elution. Some success has attended the separation of the 40 percent acetonitrile group (i.e., methoxychlor, BHC, lindane, parathion, malathion and diazinon) by putting them through an Attasol column with a series of petroleum ether-isopropyl chloride eluents. Practically speaking, however, the possible residual insecticides in a sample are usually known and the separation into the three groups with different dilutions of acentonitrile plus several rather simple color tests enable the contaminants to be identified. It should be mentioned that tests with a considerable number of other eluents

singly and in combination did not reveal any that equalled the acetonitrile series.

The wax column has been put into routine use in our residue analyses on samples supplied by our field entomologists from their experimental work. These samples include both plant and animal products, fresh and processed, and by their diversity have given a good test of the applicability of the purification process. To date all samples have been handled satisfactorily by the column alone except oils, e.g. olive oil contaminated with lindane, with which a preliminary partition between original solvent and straight acetonitrile, by the process described earlier, is needed.

It was mentioned earlier that a very small amount of the petrolatum-paraffin coating on the granules is removed by each portion of eluent that passes through the column. While this usually does no harm it is a weakness in the method. The original theory was that the hydrocarbon molecules in the coating would have an affinity for the hydrocarbon chains of the fats and waxes that comprise most of the extractives. The same considerations suggested that the long hydrocarbon chains in several modern plastics should also hold these extractives and have the further advantage of practically zero solubility in many solvents.

### Plastic Columns

Fairly extensive tests have been made with two materials, polyethylene and polystyrene. The first consists of saturated carbon chains whose average length determines the properties such as hardness and solubility of the plastic. Several grades are available commercially. Polystyrene is made of the same carbon chains as polyethylene but benzene ring sidegroups are spaced at regular intervals along the chain. The powdered plastics swell somewhat and become almost impermeable when used in a column with 60 percent acetonitrile. They are soluble enough in warm benzene (polystyrene) or in toluene (polyethylene) to coat powders dipped therein. As with the petrolatum-paraffin coating, alumina powder proved to be the best supporting material. The process used is to dissolve 100 grams polyethylene in 1 liter boiling toluene and add 500 grams alumina. Evaporate the solvent with hot air while stirring the whole mass continuously—a household mixer is very satisfactory. When only a fine powder remains, spread thinly on a tray and blow warm air over it until all odor of solvent is certainly gone. Screen through cheesecloth before using. With polystyrene the process is identical but the more readily evaporated benzene may be used as solvent.

The polystyrene column did not give any better purification of spinach extract than did the wax column. Apparently the decrease in solubility of the column material was offset by poorer binding of extractives. But the polyethylene column did a superior job of cleanup and passed the insecticides in short cuts. The high polymer grade Bakelite DTNH appears to be most suitable with spinach extract but other grades may have advantages for other kinds of extracts and the polystyrene column and others with entirely different polymers also may have important uses. An important point is that ignited alumina powder appears to give as satisfactory coated granules for the column as the much more expensive and hard-to-obtain chromatographic grade. It must be emphasized that the possibilities of polymer columns have barely been scratched and the subject is mentioned here only because it is a further step in the work carried out under the N.C.A. grant.

### Further Applications

Two possible applications of the improved purification techniques are of special interest. It was hoped that a quick test using the knockdown time with mosquito larvae might be developed to a practical stage so that analyses might be made within an hour or so, but the sensitivity of these larvae to some extractives and to oils in general made such a technique quite impossible with many kinds of produce until very efficient purification had been secured. This did not come about until the polymer column was devised a short time ago. We hope to explore the possibilities as soon as manpower limitations permit.

The other matter concerns the group of chemicals used to control mites of various kinds. These pests are steadily increasing in importance, especially in California, and most alarming of all, resistance to some hitherto effective chemicals has developed. Already some dozens of acaricides are on the market or under test. All of these offer a residue problem and come under federal and state regulations. In general, chemical methods for their analysis are troublesome or lacking and flies are not sensitive to most of them. We are working on a direct bioassay using mites or certain aquatic crustacea as test organisms but have no progress to report as yet.

### Details of Method

It may be helpful to any one attempting to apply the techniques described in this report to append a description of the extraction, purification and bioassay as now practiced in our laboratory.

*Extraction*—A convenient amount of sample, but not less than 1000 grams, chosen as randomly as circumstances permit, is finely subdivided in a food chopper or other convenient appliance and transferred quantitatively to a gallon jar which can be sealed tightly. One thousand ml solvent and an equal volume of 95 percent alcohol are added and the jar is rolled or shaken mechanically for an hour. In case of very wet samples enough anhydrous sodium sulfate is added to tie up most of the water so that a single liquid phase is formed. After the shaking is finished, the liquid is poured into a large separatory funnel, diluted with two liters of water and shaken vigorously for a short time. The aqueous phase which separates is withdrawn and a second portion of water is added and the separation repeated. The organic phase remaining is the recovered solvent. Its volume is measured and the assumption, checked by experiment, is made that the contaminating insecticide from the sample is uniformly distributed between the recovered and nonrecovered solvent. With the proportions mentioned, 1 ml solvent represents 1 gram sample and any aliquot volume used for analysis stands in the same relation.

If the level of residue is entirely unknown, 50 ml recovered extract are evaporated in a small beaker to about 5 ml in a warm air stream. About 5 grams clean white sand are added and evaporation continued until the solvent appears to be gone. The remaining extractives plus the toxicant will be distributed over the surface of the grains of sand. Six ml pure acetonitrile are added and the mixture is raised to the boiling point, carefully avoiding local overheating. Four ml water are added and the resulting solution is cooled and added to the wax column which has been flushed with 60 percent acetonitrile. The sand is rinsed with two 5 ml portions of hot 60 percent acetonitrile which are added to the column as before.

*Purification*—Whn the concentrated extract has just settled into the top granules of the column (a low air pressure may be used to hasten this process, but avoid pushing the liquid below the top of the column), 250 ml of developing eluent are added. This is 60 percent acetonitrile unless there is reason to make a run with 40 percent to separate out certain toxicants as mentioned earlier. Liquid should flow from the column not faster than 1 ml per minute. Usually a 150 ml portion is taken. This is shaken in a separatory funnel with 250 ml water and two succesive 100 ml volumes of petroleum ether. These are combined and aliquots taken for bioassay.

*Bioassay*—This depends upon the relation between two dosage-mortality lines. The first is obtained by exposing flies to a series of known amounts of toxicants, either in a pure state or recovered from a sample of the same kind of produce as that analyzed.

The other line expresses the mortalities of flies exposed to a series of volumes of purified extract from the sample. The data for each are plotted on log dosage-probit paper and straight lines should be obtained, at least over the 10 to 90 percent mortality range. Data in the middle range of mortality are especially significant. The lines should be parallel and any wide departure from this condition gives reason to suspect an error.

From the known doses an $LD_{50}$ is read in terms of micrograms of toxicant per vial and from the extract an $LD_{50}$ is obtained in terms of mls of purified extract. Since this was made so 1 ml corresponds to 1 gram sample, the $LD_{50}$ in mls is interpreted as the grams of sample which contain an amount of toxicant that kills half the flies, i.e., the $LD_{50}$ of the line for known amounts. Dividing the $LD_{50}$ in micrograms by the $LD_{50}$ in grams of sample gives the contamination in ppm directly. Of course, the calculation may be made through the actual amount of toxicant per ml of purified extract and if the ratio of sample weight to extract volume is not unity, this more roundabout way must be used. For more details concerning the bioassay techniques, reference may be made to the earlier article by Hoskins, Witt & Erwin (6) and to a forthcoming one by Erwin, Schiller & Hoskins (in press, 1955).


REFERENCES

(1) Hoskins and Caldwell, *Soap and Sanitary Chemicals 23*, No. 4, 143-5, 161, 163, 5, 7, 1947

(2) Laug, *Jour. Pharm. and Exper. Therap. 93*, 277-81, 1948

(3) Doenier, Hinchey and Incho, *Bur. Ent. and Pl. Quar.*, E.-733, 7-9, 1947

(4) Hoskins and Messenger, *Advances in Chemistry Series*, No. 1, 93-8, 1950

(5) Jones and Riddick, *Analytical Chemistry 24*, 569-71, 1952

(6) Hoskins, Witt and Erwin, *Analytical Chemistry 24*, 555-60, 1952


# Development of a Simplified Bioassay Procedure for Determining Insecticide Residues in Raw and Canned Products


**By Frank C. Lamb,**
**Western Branch Laboratory,**
**National Canners Association**


The bioassay technic developed by Dr. Hoskins and his co-workers has proved to be a useful research tool and has been applied successfully to a number of different products and insecticides. A list of these products with the insecticides that they have been tested for is shown in Table I.

The method was not designed, however, for the routine analysis of large numbers of samples where speed and simplicity of operation are prime requisites, and the highest degree of accuracy and sensitivity may not be required. Our Laboratory has investigated this method with a view toward reducing it to the essentials of a satisfactory control method. Factors which may lead to difficulty in its practical application were also investigated.

## Rearing of Flies

The first step that was investigated was the rearing of flies. Several methods of rearing were investigated and it was found that the adult fly colonies suffered high natural mortality unless the larvae were given a source of high quality protein. Excellent results were obtained using horse meat as a source of protein. The possibility that accidental contamination with insecticides present in the air was the cause of high natural mortality was investigated and experiments were performed using a chamber ventilated with specially filtered air; however, feeding the larvae a diet containing horse meat appeared to solve the problem. The possibility of accidental contamination of the fly colony with insecticides used in and about the premises is a serious threat and might prove to be a problem in setting up a colony at a commercial cannery.

The adult flies for bioassay were kept in an incubator maintained at a constant temperature of 80° F. with controlled humidity and continuous illumination. The necessity of holding flies under these controlled conditions has not been established; however, it is thought to have certain advantages in producing a uniform colony and protecting the flies against accidental contamination with insecticides.

## Bioassay Procedure

The principal change in the Hoskins procedure was a simplification of the method of exposure of the flies to the insecticide and the subsequent holding of the flies after exposure. In the original procedure the flies are anesthetized and then exposed to the insecticide in small vials, after which they are transferred to cages for the 24-hour holding period. In the simplified procedure flies are exposed directly to the insecticide and held without transfer in 250 ml beakers covered with cheesecloth. The insecticide is coated on the bottom of the beaker by allowing a solvent solution of the sample to evaporate in the beaker.

In this procedure 20 female flies are placed in each beaker, the flies being at least four days old (six days after the first flies emerge from the pupae, or four days after the last flies emerge). The flies are fed by attaching a piece of cotton soaked in a sugar solution to the beaker. After holding at 80°F. exposed to light for 20-24 hours a count is made of the dead flies in the beaker.

The procedure so developed differs very little from the Hoskins procedure in sensitivity and accuracy. It differs from the Laug method, to be described by Mr. Tressler, in that only female

**TABLE I**

**List of Products and Insecticides which Have Been Bioassayed Successfully Using the Hoskins Procedure**

| Product | Raw | Canned |
|---|---|---|
| Vegetables: | | |
| Green beans | | Aldrin, toxaphene |
| Kidney beans (dried) | Aldrin, dieldrin | |
| Lima beans | | Dieldrin |
| Carrots | BHC, lindane, aldrin, dieldrin, heptachlor, chlordane, DDT, isodrin | BHC, lindane, aldrin, chlordane, DDT |
| Sweet corn (vacuum packed and cream style) | | Endrin, aldrin, dieldrin |
| Cucumbers | Lindane | |
| Peas | | Dieldrin |
| Sweet potatoes | BHC, lindane, isodrin, heptachlor, aldrin, dieldrin, endrin | BHC, lindane, chlordane |
| White potatoes | BHC, lindane, heptachlor, chlordane, endrin | |
| Sauerkraut | | Dieldrin, endrin |
| Spinach | Aldrin, dieldrin, parathion | Aldrin, dieldrin, isodrin, endrin, parathion |
| Tomatoes | Aldrin, dieldrin, perthane, DDD, lindane | Aldrin, dieldrin, lindane, perthane (juice) |
| Fruits: | | |
| Apples and applesauce | DDT, dieldrin | |
| Olives and olive oil | | Lindane [1] |
| Peaches | | Diazinon |
| Pears | | Diazinon |
| Prunes | | (strained) DDT |
| Meat: | | |
| Beef (fat, liver, heart, lean meat, kidney and brain) | | Endrin |

[1] Requires a preliminary separation with acetronitrile, sensitive to about 0.2 ppm.

flies are used and these are counted into the beakers, whereas in the Laug method unsexed flies are weighed out into flasks and an average count obtained on a known weight of flies. Older flies are used in this procedure than are used in the Laug method, and it appears to be necessary to feed the flies during the holding period to avoid natural mortality.

Samples were purified by means of the wax column technic developed at the University of California. This part of the procedure could probably be improved by utilizing the new polyethylene columns described by Prof. Hoskins. These new columns in addition to giving more efficient purification offer the possibility of re-use of the same column for consecutive samples and avoids the necessity of using chromatographic grade alumina, which is expensive and was in short supply during the past year.

Some difficulty was experienced with low recoveries of added insecticides. This appears to be primarily due to losses occasioned by transfer of the insecticides from one solvent to another rather than from losses in the column itself and some slight changes in the technic will probably eliminate the difficulty. There is some reason to believe, however that low recoveries can result in some instances from the use of too large amounts of plant extract, and the column may be limited in the amount of this material it can handle satisfactorily.

Since the major effort spent during the last year was in method development, the number of results obtained on the analysis of actual samples is limited. A number of insecticides including DDT, perthane, dieldrin, aldrin, lindane, parathion and malathion were bioassayed and $LD_{50}$'s obtained. These compared quite favorably with results obtained with the Hoskins method. Recovery tests were run on dieldrin and perthane in tomatoes and DDT and dieldrin in apples, and recoveries within 20 percent of the amount added were obtained. As previously indicated, poor recoveries were obtained in certain instances, but these were traced to the purification rather than the bioassay procedure itself.

## Applications of Bioassay

The equipment required for routine bioassay work are a chemistry laboratory containing a fume hood and other items of basic equipment and supplies, an isolated room away from the canning area for raising flies which can be maintained at a reasonably constant temperature, and special equipment for handling the flies, consisting of jars and cages, carbon dioxide for anesthesia, special food for larvae, etc.

The extraction and purification should preferably be performed by or under the supervision of a trained chemist. The bioassay can be performed by a person with a minimum amount of training but possessing a special aptitude for this type of work.

The suggestion is made that it might prove to be more economical when several canneries in fairly close proximity to each other are running residue determinations to establish a central laboratory where all of the bioassay work can be performed. By this means only a single fly colony need be maintained and the laboratory could be set up in some isolated spot free from contamination with insecticides. This laboratory would have to be assured of a steady supply of samples over a predetermined time in order to justify its operation.

In evaluating the manpower requirements of the bioassay procedure consideration must be given to the type of results that are needed. If quantitative results are required, considerably more time and effort must be expended than if only screening results are required. In the latter case it would only be necessary to know whether or not a given sample was more or less toxic to flies than a predetermined standard containing a fixed amount of a given toxicant. In this case only a single sample aliquot need be used and in the great majority of instances all of the flies would be either alive or dead at the end of the assay period. In order to obtain quantitative results a number of different sized aliquots must be run, a curve of the percent of dead flies plotted, and an $LD_{50}$ calculated. Moreover, the approximate amount of insecticide present must be known in advance in order to choose the right sized aliquots for an accurate analysis. Making a conservative estimate, we would estimate that about one-half the time would be required per sample for a screening type assay as would be required for a quantitative analysis. An estimated time for the bioassay alone, assuming a screening type analysis is to be run and large numbers of samples are to be tested, is two-thirds of an hour per sample. This includes the time required for maintenance of the fly colony, the keeping of records, etc.

The extraction and purification work will vary some depending upon whether a surface extraction only is required, such as would be the case with most raw products, or whether a complete extraction such as would be required for a canned product is needed. Using our present technic and assuming that sufficient equipment for maximum efficiency were available, we would estimate that about one hour would be required for the extraction and purification of a single sample. More time would be required for a sample difficult to extract and somewhat less for a raw sample. This would give a total time of about one and two-thirds man hours per sample for a screening test on a raw sample. These times are purely hypothetical and probably would vary over wide ranges depending upon a number of factors. In general, the time is no greater, and is probably less than would be required for a chemical estimation.

## Summary

In summary one might list the apparent advantages of the bioassay procedure as follows:

(1) A single procedure may be used for many different insecticides.

(2) Simple equipment is required and highly specialized training is not necessary.

(3) The toxicity of insecticides to flies is roughly proportional to their toxicity to humans; hence an arbitrary limit based on a known amount of a given insecticide can be used for screening purposes even though unknown insecticides may be present.

(4) Chance contamination with an unknown insecticide can be detected.

(5) An estimate can be made of the presence and toxicity of decomposition products from breakdown of insecticides during weathering, heat processing, etc.

The following disadvantages might be listed:

(1) A fly colony must be maintained and adequate numbers of flies must be available at the correct time. It must be protected against chance contamination with insecticides.

(2) A period of 24 hours is required to obtain results.

(3) Individual insecticides cannot always be separated.

(4) Inorganic insecticides and certain other pesticides cannot be determined.

(5) A low tolerance might be set for an insecticide relatively non-toxic to flies.

In general it can be said that the bioassay procedure appears to be well suited for the screening type assay which would be of most value to a cannery control laboratory. More work is required, however, to settle upon the best procedure for running bioassays and the most economical organization of the work.

# Insecticide Residue Determination Using the Hoskins Purification Procedure and Laug Housefly Bioassay Method

By C. J. Tressler
and T. H. Jenkins,
Washington Research Laboratory,
National Canners Association

For several years the N.C.A. Washington Research Laboratory has been working with the housefly bioassay method for insecticide residues in an effort to determine its possible value as a routine quality control method. After assuring ourselves that the techniques of the method itself had been brought to a workable point, and that the maintenance of a fly colony is not too difficult, we wished to apply the method under practical operating conditions.

Ideally, this would have meant setting up a fly colony and conducting assays in a factory laboratory, a plan which for various reasons could not be adopted at the time. As a reasonable substitute, a program was undertaken in which canned food products or solvent solutions of insecticides, extracted from foods under factory conditions, were analyzed for residues. For comparison purposes, determinations were made by fly bioassy and by chemical methods.

The Gerber Products Company in cooperation with the Michigan Experiment Station set up special field plots of spinach which were sprayed with four insecticides and harvests made one day and again seven days after last application. Sprays were applied on May 13, 19, June 1 and 14 as tabulated below:

| Insecticide | Concentration (*percent*) | Application rate (*pounds per acre*) |
|---|---|---|
| Parathion | 15 | 1.0 |
| Lindane | 25 | 1.0 |
| DDT | 75 | 1.33 |
| Malathion | 25 | 3.0 |
| None (control) | — | — |

The insecticides selected for the tests were chosen from those with which considerable bioassay experience had been had, rather than on their specific usefulness for the test crop.

The harvested spinach was sampled and stripped of insecticides, using technical hexane, in the Gerber Company laboratories. A portion of each lot of spinach was then canned as a puree. The hexane solutions and the canned samples were shipped to Washington for analysis.

The Beech-Nut Packing Company prepared and shipped for bioassay aliquots of pentane extracts of fresh foods from those made for chemical residue analyses in their own laboratories. Included were residue extractions from samples of spinach, green beans, celery and one lot of peaches. These represented commercial lots of products received at the factory and, in certain cases, represented products rejected for canning because of excessive residues.

## Methods

A colony of houseflies is maintained according to the Peet-Grady Method (1) with slight modifications which are being practiced at the USDA Bureau of Entomology and Plant Quarantine, Division of Control Investigations, Beltsville, Md., or at the Division of Pharmacology of the Food and Drug Administration.

One modification of importance is the addition of one-fourth pound of horsemeat to each jar of 450 grams of CSMA Standard Fly Larval Media (obtained from the Ralston Purina Company) one day after fly eggs have been placed on the media.

In the present studies, flies for bioassay were used when 30-50 hours old, timed from first emergence from the pupal stage. In order to control the time of fly emergence, so that bioassays could be efficiently scheduled, pupae were often refrigerated at 40°F. for two to four days without producing flies which were different from unchilled flies.

Insecticide residues extracted from food materials were purified for bioassay using the paraffin (5 percent) and petroleum jelly (10 percent) on alumina column technique developed under an N.C.A. grant to the University of California and previously described on this program by Professor W. M. Hoskins.

Bioassays were performed using E. P. Laug's modification of his own method published in 1946 (2). One important modification, in use at the Food and Drug Administration Laboratories and adopted for use in the present studies, is reviewed here.

Instead of counting and transferring individual, anesthetized flies into the sample beakers containing insecticide, a group of about 50 anesthetized flies is weighed and transferred. The same weight of flies is placed in all beakers. With from three to five replicates for each concentration of insecticide, the slight variation of number of flies per beaker is compensated. The number of flies per beaker is calculated at the end of a determination by killing with solvent all the flies in four to six beakers, counting these, and taking the average.

Chemical analyses were performed using the following methods:

| Insecticide | Method |
|---|---|
| Parathion | Averell-Norris (3) |
| Lindane | Schechter-Hornstein (4) |
| DDT | Schechter-Haller (5) |
| Malathion | Norris-Vail-Averell (6) |
| Chlordane | Phillips-DeBenedictis (7) |
| Toxaphene | Phillips-DeBenedictis (7) |

For lindane and DDT chemical tests, purification of extracts were made using the Davidow fuming sulfuric acid on Celite column technique (8). Additional determinations of the DDT samples were also made in which purification was performed by eluting residues in benzene through alumina (3 volumes) mixed with Attaclay (1 volume). The last technique partitioned DDT from spinach extract as well as did the Davidow method and is faster and simpler to perform.

## Discussion of Results

The fly bioassay results as well as the chemically determined results are listed in Table I.

*Parathion*—No difficulties were encountered in analyzing for residues in food treated with parathion. The results demonstrate rather good agreement between the bioassay and chemical methods.

*Lindane*—The fresh spinach samples had been stripped into hexane instead of into carbon tetrachloride. Hexane gives a very high blank with the Schechter-Hornstein method and the chemically determined results can only be considered as approximations. Even with the canned samples, which were extracted with carbon tetrachloride, the reagent blank was quite high and amounted to one-third of the value found in the sample "First harvest, canned." Treatment of extracts by the Davidow fuming-sulfuric acid column did not aid in bringing about the sensitivity desired in the chemical method.

*DDT*—With spinach harvested one day after last spray application, the bioassay and chemically determined results agree (74 vs. 71 ppm). The results of other samples from the same spinach plot show poor agreement, with the chemically determined results being about 3½ times as high as the bioassay values. Results were rechecked as many as four times with no better agreement. Solutions purified for the chemical method by the Davidow method or with alumina plus Attaclay also gave the recorded low values by bioassay.

The final blue-colored Schechter-Haller solutions were measured for density at 450 millimicrons after the regular measurement at 580. Excessive amounts of red color were not present, indicating that breakdown products of DDT were not being determined as DDT.

**TABLE I**

**Results of Insecticide Residue Analyses by Bioassay and Chemical Methods**

| Sample Description | Residue in ppm Bioassay | Chemical |
|---|---|---|
| Spinach (Gerber-Mich. Expt. Station) | | |
| Parathion | | |
| First harvest, fresh | 6.8 | 6.8 |
| First harvest, canned | 2.8 | 1.7 |
| Second harvest, fresh | 0.05 | 0.1 |
| Second harvest, canned | <0.03[a] | <0.06[a] |
| Lindane | | |
| First harvest, fresh | 9.9 | 5.4[b] |
| First harvest, canned | 0.06 | 0.3 |
| Second harvest, fresh | 0.03 | <0.05[a], [b] |
| Second harvest, canned | <0.03[a] | <0.05[a] |
| DDT | | |
| First harvest, fresh | 74 | 71 |
| First harvest, canned | 5.0 | 18 |
| Second harvest, fresh | 1.1 | 3.8 |
| Second harvest, canned | 0.4 | 1.4 |
| Malathion | | |
| First harvest, fresh | 12 | 14 |
| First harvest, canned | 4.8 | <0.5[a] |
| Second harvest, fresh | 0.3 | <0.5[a] |
| Second harvest, canned | <0.3[a] | <0.5[a] |
| Beech-Nut Packing Co. Samples | | |
| Fresh Spinach | | |
| Parathion treated | | |
| 6 different commercial lots | <0.07[a] | 0 |
| Chlordane treated | | |
| 3 lots | <0.15[a] | 0.1 |
| 1 lot | 0.2 | 0.1 |
| Fresh Green Beans | | |
| Parathion treated | | |
| 15 different commercial lots | <0.04[a] | 0 |
| Fresh Peaches | | |
| DDT treated | | |
| 1 lot | 8.3 | 8.5 |
| Fresh Celery | | |
| Toxaphene treated | | |
| 5 different commercial lots | <0.3[a] | 80 |
| 1 commercial lot | 0.6 | 80 |
| 1952 Cold Storage Lot A | 3.6 | 2.7 |
| 1952 Cold Storage Lot B | 4.2 | 4.4 |

[a] Residue not detectable. Minimum amount detectable is shown. [b] Extracts of raw spinach made in hexane. This solvent unsuitable for Schechter-Hornstein method.

With the pentane extract sent us from fresh peaches which had been treated with DDT, good agreement of results by bioassay (8.3 ppm) and by Schechter-Haller chemical method (8.5 ppm) was obtained.

*Malathion*—Somewhat the opposite effect occurred with malathion than with DDT. Good agreement between bioassay and chemically determined results were found on the lot "First harvest, fresh" (12 and 14 ppm). After canning, this spinach dropped in malathion to 4.8 ppm by bioassay but could not be detected on 100 gram samples by the chemical method. The fresh spinach harvested one week after last malathion application showed 0.3 ppm. by bioassay and again could not be detected by the chemical method. No residue by either method could be found on the second harvest after canning.

The chemical method is not as sensitive as the bioassay method but chemically, 50 micrograms gives sufficient color to be determined. Using 100 gram samples 0.5 ppm could have been detected.

It was thought that drift of another chemical spray might have occurred during field application. However, if this had happened, the bioassay of the fresh first harvest lot should have been higher than the chemically determined value. This was not the case, so drift of another insecticide can be ruled out. As yet no plausible explanation is available for the discrepancies found.

*Chlordane*—Insufficient solvent extract was furnished to use large enough samples for bioassay at a residue level lower than 0.15 ppm. One sample showed a residue of 0.2 ppm which had been reported to us as having 0.1 ppm by total chlorine.

*Toxaphene on celery*—The first series of samples consisted of toxaphene stripped from celery with pentane and dried on sand. The six lots received for bioassay had shown 80 ppm toxaphene by total chlorine analyses. By bioassay, five lots showed no residue and one contained 0.6 ppm.

The second series of samples consisted of toxaphene extracted in pentane from two lots of celery stored since 1952. The March, 1952, total chlorine value demonstrated 7.4 ppm toxaphene to be present. The 1954 value was 2.7 ppm on Lot A and 4.4 ppm on Lot B. Bioassay values totaled 3.6 and 4.2 ppm for the same respective samples.

For both sets of celery samples, extracts from untreated control lots were furnished. Bioassay of these samples shows that celery extract, even after purification, has a knockdown effect on flies which lasts for a few hours. The flies recover before the end of the test period so that final L.D. 50 values are not affected.

In the second series of samples fair agreement of results for toxaphene by total chlorine and bioassay was obtained. In the first series the results are in extreme disagreement, but no plausible reasoning has been proposed which seems to account for this.

Salt is sometimes applied to the soil in the culture of celery and it was suggested that this chemical may have increased the total chlorine. This reasoning is not supported by the control lots which did not show high total chlorine values.

Toxaphene evidently does not break down into a chlorine-containing nonvolatile residue; otherwise agreement of the two methods for the second series of samples would not have been achieved.

*Effect of Processing DDT and Malathion in Spinach*—Because of the lack of complete agreement between bioassay and chemically determined results obtained with field trial spinach samples treated with DDT and malathion, a laboratory experiment was performed to test recoveries of the insecticides added to spinach. Tests were made before processing and after processing.

About 6 kg. of previously canned pureed spinach, grown without insecticide application, was divided into three portions. One portion served for control purposes, to the second 10 ppm of DDT was added, and to the third 10 ppm malathion was added. Rapid blending of the spinach and insecticide, previously dissolved in a small amount of alcohol, was used to insure uniform distribution.

About half of each lot was separated and held under refrigeration for analysis as unprocessed product. The rest of each lot was heated to 200° F., filled into 5 oz. glass jars, and heat processed for 43 mins. at 240°F.

The results of analyses are shown in Table II. It will be seen that DDT recoveries were quite reasonable by both the bioassay and chemical methods. No analytical discrepancies were found as had been the case with the Gerber-Michigan Experiment Station samples. The loss of DDT on heat processing was not as great as had been expected, but it should be noted that no washing, blanching, and pulping operations were involved.

The malathion results followed much the same pattern as the Gerber-Michigan Experiment Station samples had shown. Before processing, recoveries by bioassay were fair (70

**TABLE II**

**Effect of Processing on Recovery of DDT and Malathion Added to Spinach**

| | Bioassay ppm | Chemical Assay ppm |
|---|---|---|
| DDT, 10 ppm added: | | |
| Recovery before processing | 8.7 | 9.6 |
| Recovery after processing | 6.3 | 8.8 |
| Malathion, 10 ppm added: | | |
| Recovery before processing | 7.0 | 9.5 |
| Recovery after processing | 2.5 | <0.5* |

* Residue not detectable. Minimum amount detectable is shown.

percent), and good by the chemical method (95 percent). After processing, the bioassay method showed 25 percent of the malathion remained, but this could not be detected chemically. This discrepancy leads to the supposition that processing may partially decompose malathion into a product with toxicity to flies, but which does not react chemically like malathion.

## Conclusions

Analyses of four food products were conducted, involving residues of six insecticides, by fly bioassay for comparison with results by chemical analyses.

Good agreement, in general, was found between results by the two types of analyses.

Poor agreement was obtained with certain samples between bioassay and chemically determined results. These included some of the spinach samples to which DDT or malathion had been applied and one series of celery samples treated with toxaphene. No explanation has been found for the lack of agreement in these particular cases.

Heat processing of spinach has an effect on malathion which leaves a material toxic to flies but not detectable by the chemical method.

The bioassay procedure was found to be simpler and easier to use than the chemical methods, particularly in that only one basic procedure is involved.

The bioassay method was found to be more sensitive than the chemical methods used, except in the case of toxaphene where 0.5 ppm is needed for detection by bioassay of 20 gram samples as against about 0.05 ppm by the total chlorine methid.

A study of the results indicates that the over-all estimation of toxicity in a food by bioassay is fairly accurate. Accuracy, as measured by percent recovery of DDT and malathion added to unprocessed spinach, was less by bioassay than by chemical methods. After processing, the situation for DDT was about the same, but for malathion the chemical method could not be relied upon to detect a residue quite toxic to flies.

In terms of residue analysis on a quality control basis, the fly bioassay procedure offers a sensitive tool which can be relied upon to give a reasonably accurate estimation of insecticide residues present. The same basic method can be applied to numerous foods and can be relied upon to detect any of a long list of pesticides.

## References


(1) "Pest-Grady Method", *Soap Blue Book*, Chemical Specialties Manufacturers Association, New York, 1954.

(2) "A Biological Assay Method for Determining 2, 2 Bis (p-Chlorophenyl)-1, 1, 1 Trichloroethane (DDT)", E. P. Laug, *Jour. of Pharmacology and Experimental Therapeutics*, *88*, No. 4, 324, (1946).

(3) "Estimation of Small Amounts of Thiophos or Parathion", P. R. Averell and M. V. Norris, *Anal. Chem.*, *20*, 753 (1948).

(4) "The Determination of Benzene Hexachloride by a Colorimetric Method", M. S. Schechter and I. Hornstein, *Anal. Chem.*, *24*, 544 (1952).

(5) "Colorimetric Tests for DDT and Related Compounds", M. S. Schechter and H. L. Haller, *J. Am. Chem. Soc.*, *66*, 2129 (1944).

(6) "Colorimetric Estimation of Malathion Residues", M. V. Norris, W. A. Vail and P. R. Averell, *J. of Ag. and Food Chem.*, *2*, 570 (1954).

(7) "Sodium Reduction Technique for Microdetermination of Chlorine in Organic Insecticides", W. F. Phillips and M. E. DeBenedictis, *J. of Ag. and Food Chem.*, *2*, 1226 (1954).

(8) "Isolation of DDT from Fats", B. Davidow, *J. Assoc. Official Agr. Chem.*, *33*, 130 (1950).


# Effect of Applied Pesticides on Flavor Changes in Canned Foods


**By Elly Hinreiner,**
**Dept. of Food Technology,**
**University of California**


Since the first recognition that certain applications of benzene hexachloride are capable of undesirably influencing the flavor of treated food crops, a vast amount of effort has been poured into attempts to determine which of the newer-type organic pesticides are apt to cause flavor changes, under what conditions of use, and whether these changes are of practical importance to the consumer. The problem has proved to be an extremely complex one, and as yet we have only empirical means for solving it. So many variables—not only crop and dosage level, but also time of application, type of soil, climate, irrigation practices, processing, storage, and, of course, the acuity of the particular human who tastes it—are involved in deciding whether a given pesticide will or will not give rise to objectionable flavor changes, that it is a hopeless task to test all of the factors experimentally. Nevertheless, a very large amount of experience has accumulated, and it is becoming possible in the case of many of the important new pesticides to make intelligent guesses about the suitability of their use in a given situation as far as flavor effect is concerned.


The information in this survey of the pesticides is a compilation of the work of many food technologists in laboratories throughout the country. Much of it is already in print; some is still unpublished and permission has been generously granted by the workers involved in each case to quote from this most recent material. Especial acknowledgment is due to Dr. Alice M. Briant, New York State College of Home Economics, Cornell University; Dr. Wilbur Gould, Ohio State University; Dr. J. C. Hening and A. C. Davis, New York State Agricultural Experiment Station; Dr. Walter A. Maclinn, New Jersey Agricultural Experiment Station; Dr. Edward Ross and Margaret Hard, State College of Washington; Mrs. Lois Sather, Oregon State College; and Dr. K. G. Weckel and John J. Birdsall, University of Wisconsin, for their generous response to my plea for information on the results of flavor testing programs in their laboratories.


It should be remembered in considering the almost bewildering array of data, that the techniques used in taste-testing in the different laboratories vary considerably, and it is probably impossible to give the same sort of interpretation to all of the information, or even to reduce all of the data to the same basis. When the other aforementioned variables of soil type, climate, etc. are superimposed, it is not too hard to understand why occasionally the results appear to be contradictory. It is probably best to look at the general tendency of a pesticide to cause flavor difficulties, as revealed by a large number of difference experiments, rather than at the results of any one particular experiment by itself.

For convenience in discussion, most of the organic pesticides about which flavor information is available may be classified into four chemical groups: the chlorinated hydrocarbons, the sulfones, sulfites, and sulfonates, the diphenyl carbinol derivatives, and the phosphates and thiophosphates.

In the first group are benzene hexachloride and the pure (90 percent or better) gamma isomer of BHC known as lindane. There can be little doubt about the tendency of this compound to produce undesirably musty or moldy flavors in food crops. Indeed the whole program of checking new organic pesticides for their effect on food flavor was stimulated by the observation of the off-flavors resulting from the use of benzene hexachloride. Even at dosage levels as low as 0.5 pounds/acre, experiments at the University of California (15) have indicated that canned carrots and sweet potatoes show decided off-flavors, though the effect on the fresh vegetables is not as severe. Lindane at

0.5 to 1.0 pounds/acre does not seem to cause flavor differences in fresh vegetables to the same extent as technical BHC, but frequently creates flavor problems when these same vegetables are canned. Apparently the heat treatment involved in processing causes changes which intensify development of off-flavors. This is in accord with the published findings of Bailey, Esselen, and Wheeler (1), of Cochran and Van Blaricom (3), and of Gilpin, Dawson, and Siegler (6), who observed independently that peaches from trees sprayed with BHC were more apt to show off-flavors when canned than when fresh or frozen, and when stored a long time than when tasted shortly after processing. It also bears out the findings of Brittin and Fairing (2) that foods to which they added a small quantity of 98 percent gamma-isomer benzene hexachloride developed after processing a flavor similar to that of the crude product.

Hening and Briant conducted taste tests on fresh, frozen, canned and jammed strawberries treated with 2 and 4 pounds/acre of lindane and these experiments were reported by Gyrisco and Burrage (11). Only the canned and jammed berries showed off-flavors that were of possible statistical significance. Higher dosage levels, such as the 3 pounds/acre lindane treatment tested by Sather (20) and the 8 pounds/acre treatment investigated by Weckel and Birdsall (24) have almost invariably adversely affected the flavor of canned vegetable crops, however.

Some experiments have also been made to check the effect of treatments with BHC or lindane on the flavor of crops grown in the same soil one, two, or more years after pesticide application. Maclinn at the New Jersey Agricultural Experiment Station (16) has investigated the flavor of a number of frozen vegetables (and canned onions and tomatoes) grown one, two, and three years after treatment of the soils with 0.5 pounds/acre and with 15 pounds/acre of BHC as well as with various dosages of lindane, chlordane, and DDT. Although there was some variability from crop to crop, both dosage levels resulted in flavor differences (from the controls) in most of the vegetables over all three years.

DDT (dichlorodiethyl-trichloroethane) is usually considered to be free from effect on flavor, and little flavor testing has been done on it. Hening, Davis, and Robinson (13) report no significant differences in various canned vegetables grown in soil treated with 50 pounds/acre of the pesticide. However, Maclinn (16) reports quite a number of significant differences (not necessarily unfavorable, of course) in the flavor of frozen vegetables grown in soils treated one, two, and three years previously with dosages of 9½ pounds, 24 pounds, and 119 pounds/acre. Purified DDT appeared to have no advantage over the technical product in this respect.

Aldrin and dieldrin, and to some extent isodrin and endrin, all of them closely-related chlorinated naphthalene derivatives, have been the subject of a great many flavor investigations (21). The majority of food crops treated with aldrin and dieldrin appeared to show no flavor differences from untreated checks even at dosage levels up to 10 or 12 pounds/acre when used as a soil treatment. There are, however, a number of isolated instances where off-flavors were noted in a particular sort of fruit or vegetable even though other crops treated at the same dosage were unaffected. The undesirable flavors again were noted with far greater frequency in canned foods than in fresh or frozen. Among these instances were aldrin-treated canned squash, carrots, beans (Hening and Davis (14)), sauerkraut (Weckel and Birdsall (24)), strawberries, corn (Sather (20)), and lima beans (Hinreiner and Simone (15)), and dieldrin-treated canned squash, carrots, and beets (Hening and Davis (14)). Using dieldrin in the form of a 25 percent wettable powder as a spray (2 pounds/100 gallons) Gould, Davis, and Queale (8) found it produced no significant flavor changes in canned potatoes, lima beans, or tomato juice. Gould (9) also reports no flavor change in snap beans following treatment with endrin or dieldrin. Canned beets and canned pumpkin grown in soil treated with endrin at 8 pounds/acre have been reported as off-flavored, as well as canned pumpkin given a foliage application at 1 pound/acre (Weckel and Birdsall (24)). On the other hand, fresh potatoes, canned strawberries (Sather (20)), canned carrots, potatoes, beans, etc. (Weckel and Birdsall (24)) treated with as much as 10 pounds/acre of this pesticide showed no significant differences from the controls. Isodrin at 5 pounds/acre was found to affect adversely the flavor of canned carrots and fresh and canned sweet potatoes (Hinreiner and Simone (15). Even at 10 pounds/acre Sather (20) found no apparent effect on canned or frozen strawberries or fresh-cooked potatoes.

Reports of off-flavors resulting from use of chlordane or heptachlor at dosage rates of 10 pounds/acre or less are unusual, and even where differences are found the flavor of the treated material is not necessarily undesirable. At 16 pounds/acre of chlordane Weckel and Birdsall (24) report statistically significant off-flavors in canned potatoes, pumpkin, and sauerkraut, and at 20 pounds/acre Hinreiner and Simone (15) found undesirable flavor changes in canned sweet potatoes that had been stored six months. No reports are available on heptachlor at such high dosage rates. In Maclinn's (16) studies on the effect of pesticides in successive years after application some flavor differences were found in the frozen vegetables at all three dosage levels (8, 15, and 75 pounds/acre), but this situation did not appear to occur any more frequently at the higher dosage levels than at 8 pound/acre, and there seemed to be no tendency for flavor differences to occur less frequently in the third than in the first or second years after soil treatment. Again, of course, the differences found were not necessarily undesirable ones with respect to the pesticide-treated sample.

Weckel and Birdsall (24) have tested the effect of toxaphene (24 pounds/acre soil treatment and 6 pounds/acre foliage treatment) on various canned vegetables, and found significant flavor differences with the soil-treated pumpkin and the foliage-treated sauerkraut, but none with any of the other four vegetables tested. No flavor effect of toxaphene on sweet potatoes or peanuts was observed by Gilpin and Geissenhainer (5), or by Gilpin, Dawson, Geissenhainer, and Reynolds (4) even at dosage rates of 25 and 31 pounds/acre. On the other hand, Gould et al. (7) found that spraying with 25 percent toxaphene resulted in canned potatoes having a less desirable flavor, though leaving canned tomatoes and lima beans unaffected.

The various sulfonates and related sulfur derivatives include ovotran, genite-923, sulfenone, and aramite. For the most part these have been tested for flavor effect on fruits such as peaches and pears where they have been applied as miticide sprays. At the University of California (15) all four of these miticides, along with others, were applied to pear trees in the 1952 season, and again in 1953. All four of the treated samples in the 1952 season were significantly different from, and less desirable than, the controls when tasted as canned fruit. This observation was repeated at each of the three sets of tastings made after storage periods ranging from 2½ to 11½ months. In many cases, though, the distinction was made on the basis of an observed lack of natural pear flavor in the treated fruit, rather than because of any "off-flavor." Repetition of the experiment in the following season gave rather different results. Although one or two of the tests indicated possible flavor problems, none of these four pesticides resulted in serious differences. This may have been the result of a heavier mite infestation in 1953, reducing the quality of the untreated, and hence most badly affected, fruit. Peaches and apples were sprayed with the same miticides in the 1953 trials and with them differences were more apparent. Ovotran and sulfenone did not appear to have any adverse effect on flavor, but the panels indicated fairly serious off-flavors in the canned genite-treated peaches and applesauce, and a possible flavor problem in the aramite-treated peaches. Sather at Oregon State College (20) has also tested the effect of sulfenone on canned pears and peaches and found no serious flavor differences.

In 1952 genite-923 ovotran applications were made on peach trees at various stages in their growing cycle strating with the pre-bloom period. Except for the pre-bloom treatments, highly significant differences were observed with both miticides, in most cases indicating serious flavor defects in the treated peaches (15).

Genite-923 and aramite were both applied as dusts to snap beans in tests reported by Reynolds, Anderson, and Swift (18). A panel found the genite-treated, cooked beans to be off-flavored when tasted two weeks after treatment, but not significantly different from the control after five weeks had elapsed. No apparent flavor differences were caused by the aramite. Severe off-flavors were observed in fresh strawberries sprayed with genite at the rate of 1 quart actual genite/100 gallons (Hinreiner and Simone (15)).

The diphenyl carbinol derivatives, chlorobenzilate, dimite, and genite-876 are relatively new, and have been but little studied for their flavor effects. Ross and Hard (19) tested the effect of chlorobenzilate sprays on the flavor of fresh and canned peaches and apples. Although flavor differences were observed in two instances, they apparently were due to differences in sweetness or maturity, not to any off-flavor. Canned pears, peaches, and applesauce made from fruit treated with chlorobenzilate, dimite, and genite-876 in 1953 were tasted at the University of California (Hinreiner and Simone (15)). In these tests chlorobenzilate showed no adverse effect when the fruit was tasted within a few months after canning, but after storage for eight months there was a tendency for the panel to find the treated fruits slightly less desirable. The same observation was made on the dimite-treated pears and applesauce, though not on the peaches. Probably in neither case were the differences of much importance, but with so little information available on these pesticides, more observations are needed before coming to a conclusion. Genite-876 did not have any adverse effect on flavor in these experiments.

Of the phosphate and thiophosphate pesticides, malathion and parathion have been most thoroughly investigated. Probably because of their volatility, they rarely appear to cause flavor problems in foods. The most extensive study on the flavor effects of malathion so far reported is that by Hard and Ross (12), who tested various dosage levels of this pesticide applied as dusts or sprays to apples, peaches, pears, cherries, strawberries, pototoes, peas, and beans. Although in a few unrelated instances the panel found differences in flavor between treated and untreated samples, the differences seemed to be due to variations in sweetness or maturity, except possibly in the case of some canned peas which were sprayed with a relatively high concentration of malathion only nine days before canning.

Numerous tests at the University of California (15) on canned pears, peaches, and apples, freshly harvested as well as stored grapes of several different varieties, melons, and dried figs and raisins, all treated with malathion-containing sprays or dusts, gave results in agreement with the findings of Hard and Ross. In only two instances did the data suggest even a possibility of off-flavor. One of these occurred with pears when tested 11 months after canning, and did not seem to imply a very serious quality difference; the other case was some canned applesauce which appeared to have a decidedly objectionable taste after two months' storage, but was not significantly different from the control after six months. Perhaps this result was due to some entirely unrelated cause, but the original "off-flavor" was so pronounced, and observed by so many people, including a number who were not on the official panel, that the test is being repeated this year. So far, all that can be said is that no off-flavor has been noted in the treated apples one month after canning.

Malathion dust was applied to snap beans in studies conducted by Sather (20) and by Reynolds, Anderson, and Swift (18) also. In neither case were there significant differences from the controls. The latter investigators also included parathion dusts among their treatments and found no significant flavor difference in this case either. Parathion treatments at the rate of 8 and 12 pounds/acre were included in the strawberry tests performed by Hening and Briant (see Gyrisco and Burrage (11)). Except for some of the canned and frozen berries treated at the higher dosage level, no off-flavors were observed. Several investigators (Smith, Jones and Rigney (22); Smith, Jones and Calvin (23); and Cochran and Van Blaricom (3) have reported low residues and absence of off-flavor in peaches sprayed with parathion. The same may be said of citrus juices from parathion-treated trees (Olsen, Stearns, and Hendrickson (17); Griffiths, Reitz and Olsen (10). On the other hand, Maclinn, Reed and Campbell (15) stated that potato plants sprayed or dusted with parathion produced strongly off-flavored tubers, and that parathion soil applications created more serious flavor problems in potatoes in the second year than in the first after treatment of the soil. Gould et al. (7), working with three different panels, found that certain of these groups observed lowered quality in parathion-dusted canned potatoes and tomatoes, but that generally these vegetables as well as canned carrots, lima beans, and peaches were rated not significantly different from the controls. Spray applications of various formulations of malathion as well as of parathion (15 percent wettable powder) also appeared to cause no lowering of flavor quality in canned or chipped potatoes, canned lima beans, or tomato juice, according to Gould, Davis and Queale (8).

Investigations on the flavor effect of the systematic pesticides, systox and OMPA (octamethyl pyrophosphoramide), have been started only recently. Gould, Davis, and Queale (8) report no flavor effect from use of systox on raw cabbage, canned potatoes, potato chips, lima beans, or snap beans, but a statistically significant difference (1 percent level) with canned tomato juice. Systox used as a spray on pears, peaches, and apples was also not detected in the canned fruit in experiments conducted by Hinreiner and Simone (15), except for a slight off-flavor developing in the apples after six months' storage. Systox treatment of walnut trees was found to have no effect on the flavor of the nuts.

Even fewer flavor results are available on OMPA, and it seems impossible, therefore, to come to any conclusions about its use.

## References


(1) Bailey, J. S., Wm. B. Esselen, Jr. and E. H. Wheeler. 1949. *J. Econ. Entomol. 42*, 774-6.

(2) Brittin, W. A. and J. D. Fairing. 1950. *J. Assoc. Off. Agr. Chem. 33*, 599-607.

(3) Cochran, J. H. and L. O. Van Blaricom. 1950. *Food Packer 31*, No. 4, 30-1, 50, 61-2, 64.

(4) Gilpin, G. L., E. H. Dawson, E. L. Geissenhainer and H. Reynolds. 1953. *Food Tech. 7*, 132-5.

(5) Gilpin, G. L. and E. L. Geissenhainer. 1953. *Food Tech. 7*, 137-8.

(6) Gilpin, G. L., E. H. Dawson and E. H. Siegler. 1954. *J. Agr. Food Chem. 2*, 781-3.

(7) Gould, W. A., J. P. Siessman, R. W. Rings, M. Lynn, F. Krantz, Jr. and H. D. Brown, 1951, *Food Tech. 5*, 129-33.

(8) Gould, W. A., R. B. Davis and D. Queale. Unpublished results of 1952 flavor evaluation program.

(9) Gould, W. A., Ohio State University. Private communication on 1954 flavor tests.

(10) Griffiths, J. T., Jr., H. J. Reitz, and R. W. Olsen. 1950. *Agr. Chem. 5*, No. 9, 41-3, 99.

(11) Gyrisco, G. G. and R. H. Burrage. 1954. *J. Econ. Entomol. 47*, 859-63.

(12) Hard, M. H. and E. Ross. 1954. *J. Agr. Food Chem. 2*, 20-2.

(13) Hening, J. C., A. C. Davis and W. B. Robinson. 1954. *Food Tech. 8*, 227-9.

(14) Hening, J. C. and A. C. Davis, New York State Agricultural Experiment Station. Private communication on 1953 and 1954 flavor tests.

(15) Hinreiner, Elly and Marion Simone, University of California, Davis. Unpublished work.

(16) Maclinn, W. A., New Jersey Agricultural Experiment Station. Private communication on 1951-53 flavor tests.

(17) Olsen, R. W., C. R. Stearns and R. Hendrickson. 1952. *Food Tech. 6*, 350-1.

(18) Reynolds, H. T., L. D. Anderson and J. E. Swift. 1952. *J. Econ. Entomol. 45*, 359-65.

(19) Ross, E. and M. H. Hard, Washington Agricultural Experiment Stations. Project Report, February, 1954.

(20) Sather, Lois, Oregon State College. Private communication on 1953 and 1954 flavor tests.

(21) Shell Development Company, 1954. Agricultural Handbook for Aldrin and Dieldrin.

(22) Smith, C. F., I. D. Jones and J. A. Rigney. 1949. *J. Econ. Entomol. 42*, 616-23.

(23) Smith, D. F., I. D. Jones and L. D. Calvin. 1950. *J. Econ. Entomol. 43*, 179-81.

(24) Weckel, K. G. and J. J. Birdsall, University of Wisconsin. Private communication on 1954 flavor tests.

# PROCUREMENT OF RAW PRODUCTS

PRESIDING: W. Stanley Macklem, Chairman, N.C.A. Raw Products Committee; Curtice Brothers Co., Rochester, N. Y.

PANEL DISCUSSION: "How Can We Persuade Farmers to Grow Our Canning Crops?"

PANEL MEMBERS: Mark H. Mitchell, The Larsen Company, Green Bay, Wis.; James D. Swan, President, Vegetable Growers Association of America, Delavan, Wis.; Hamilton Carothers, Office of Counsel, N.C.A., Washington, D. C.; H. L. Stier, Director of Statistics, N.C.A., Washington, D. C.

## Financial and Material Services as Inducements to Growers

**By Mark H. Mitchell,**
**The Larsen Company**

Although the subject of this presentation as printed on the program is "Material and Financial Inducements to Growers," it is to be especially noted that the theme of this session is "How Can We Persuade Farmers to Grow Our Canning Crops?" The theme is the important thing because:

Grower inducements are not simple matters of economics. If you're looking for some gimmick—some stunt—some short-cut incentive to solve a grower relations problem, you're destined to be very disappointed; there aren't any. No price you can offer nor free service you can provide is sufficient inducement in itself. Take a good long look at your relationship with growers. Certainly you believe there are advantages to growers in doing business with you, advantages to them in contracting for the production of the crops you need. Your problem, of course, is to get the growers to believe so too. If the growers are to believe, they must have faith or confidence in you and that faith or confidence is something you can't buy, it is something you must earn, and there really is only one way to earn it—through a long-term program based on sound policies related to an old, old principle—the Golden Rule.

Let's face the facts. Our business is based on agriculture. Let's admit the truth. We processors need the growers more than they need us. Surely the grower's importance to us is deserving of a well-planned and organized program aimed at earning the grower's confidence, rather than a clumsy ill-advised attempt at bribery or subsidy.

Our business is dependent on a continuing and reliable supply of canning crops from the agricultural community. If we are to continue successfully, there must be more soil conservation and better soil management, there must be further development and use of improved varieties, better equipment and methods, fungicides, insecticides, etc. Canning crops must be included in a balanced farm program. Canning crop dollar returns must be competitive with other crops. Our relationship with the producers must be friendly, fair and businesslike. There are situations in the production of some crops making it definitely necessary that we step in with assistance to growers with specialized equipment or service or labor. Spend some time thinking about such matters and you will have taken a step in the direction of establishing a policy in which grower inducement can exist.

Give consideration to the thought that the first answer to the question of our theme "How Can We Persuade Farmers to Grow Our Canning Crops?" involves setting up an agricultural policy, developing the courage to follow it, and providing competent field representation to make it effective. The real inducement for growers to produce crops for you will then be your reputation for active and responsible citizenship in your own agricultural community.

Now let's consider financial and material inducements to growers, specific matters that may or may not work within the framework of any one overall situation.

Consider price in terms of grower incentive. The specific price you pay per ton or per pound for a crop is probably not nearly as important a grower inducement as you may think. It is very important, of course. All-important—definitely no. Isn't it reasonable that our canning crops should afford growers returns per acre that are competitive with alternative crops they may produce? That is not to say that the price per pound or per ton of a processing crop under contract need match the price per pound or ton of whatever other crop might happen to be the "hot" one in price in any particular season. Certainly not. For that matter, in any one year, returns per acre for a contract processing crop need not equal those for the best paying deal. There will be plenty of grower incentive if, on a year-in-year-out basis, price can be multiplied by a yield that will give returns per acre competitive to the average of alternative and comparable crops. Certainly sweet corn at $60 per ton wouldn't be very much of an incentive if the yield were one-third of a ton per acre, nor if the cost of producing it was way out of line with that of comparable crops. That's where competent field representation can help by being in position to do something to raise yields or assist in lowering production costs.

Prices can be scaled to reflect some relationship in quality or perhaps yield. When they are, they do provide positive incentive for the grower. Where differences in raw produce quality are measurable, we should be willing to pay more for the best, if that's what we want. We should try to have a schedule of prices scaled to provide the grower with at least the same return if not more per acre for top quality. Many flat price deals or even graded price deals do the opposite. We cannot expect to acquire top quality produce consistently on a field run price basis. It isn't quite fair and, besides, we are not likely to succeed in doing anything other than putting grower incentive in reverse.

There's more to price in terms of grower incentive than the amount or scale one pays. For example, the company I represent follows a one-price-one-set-of-terms-for-all policy. That means that we have our prices printed in our contract, not written in pencil in a space provided for that purpose. Everyone in our territory learns that with us there is just one deal, and no one gets a nickel more per ton nor a nickel less than anyone else for comparable quality, nor does anyone receive payment on more favorable terms than anyone else, neither earlier than due dates nor later. We have found our policy reasonable and acceptable to everyone—even those whose requests for advance payment are therefore denied. We explain our position to everybody including the occasional grower who suggests that he ought to have a better deal. As a result our growers know that we do not do business on an under-the-table nor on a special favor basis. That alone is an inducement for growers.

Consider another factor in grower incentive: the charges made against growers for seed or other materials furnished to them. Doubtless there

are as many differences of opinion regarding the do's and don't's on these charges as there are individual processors. Pea seed is a high cost example. Some established a so-called "free seed" contract. Some establish a charge per bushel that covers some portion of the cost—one-third, one-half, or possibly two-thirds. Others establish what is considered a full cost charge. Since the price to be paid for peas is always adjusted according to the amount of the seed charge, one might consider that there is no real element of grower incentive in this matter of seed charge. Pea seed charges can be handled any way you wish, but there is an element of incentive and it can work two ways. Doubtless so-called "free seed" is an incentive in that there is an implied release of obligation on the part of the grower insofar as repayment is concerned. There may also be an implied obligation on his part to return the "favor." On the other hand, some of us prefer to avoid certain other implications of so-called "free seed." If it seems to be free, maybe it isn't worth very much, so it may be carelessly handled or planted on less desirable, less productive land.

In some areas it is very common for canners to furnish growers with fertilizer, the cost of which is to be deducted from crop proceeds. Certainly this sort of financing of a portion of the grower's out-of-pocket production costs is an incentive. But again it may be good or bad—good if it works out the way you want it to, and bad if the deductions made later make it seem to the grower as if he is paying for a dead horse.

Grower inducement may be related to the loan of planters or harvesting equipment or the performance of dusting, spraying, or harvesting services. We certainly need to be able to offer growers at least some degree of cooperation toward the lowering of production costs. It is essential that we ourselves keep up to date on labor saving methods, and of course, many of our crops require specialized equipment. This is particularly true in the case of such crops as peas and corn. Frequently there is no choice whether such equipment is made available to growers or whether certain harvesting labor or services are performed for growers. We either do, or else. However, the basis on which services are performed or equipment loaned may definitely be a grower inducement in varying ways—some desirable and some not so much so. For instance, equipment or service performance provided can be on a definite pre-established fee basis or on what is termed "at cost." Doesn't it seem reasonable that having specific service charges set into the agreement would be as important as having specific prices for crops? In many cases, particularly where harvesting services may be performed by crews recruited by canners, growers may have very little control over costs. In this kind of a situation charges can be established on some basis to insure the grower against being subjected to unreasonably high costs by reason of inefficient labor or inadequate equipment.

This whole matter may be considered the subject of subsidies. Not governmental subsidies—oh, no—we know we are against governmental subsidies. Reference here is to private subsidies that we provide to growers; we usually call them inducements or incentives. They're subsidies just the same and very very much like governmental subsidies in certain important respects. They're supposed to be inducements to the right people. But hardly anyone recognizes what they really are, and seldom does anyone know what they cost.

Differences in pea seed charges are but one small example. We need to give careful consideration to our policies and practices in this regard. There are at least two sides to the question—several in fact. Some in our industry favor offering to growers "free" seed or plants—the loan of equipment or performance of services "without charge." Naturally, compensating adjustment in such cases shows up in lower price. Few are so naive as to think it is possible to get something for nothing.

Circumstances vary from area to area but principles seldom do, so let's not kid ourselves nor attempt to kid our growers. Every material or service furnished to the grower costs something. The element of inducement—to whom it applies—whether or not a subsidy is involved and recognized—how it works—all depend on how these costs are handled.

Take mechanical sweet corn picking as an example. Generally the indirect costs of mechanical picking (maintenance labor and materials, depreciation, interest, etc.) about equal direct costs. If forgotten or not counted, these indirect costs amount to an unrecognized subsidy to the grower; certainly no inducement is involved if unrecognized by either party. But let's say all of the actual costs are counted. Then how applied? If an average figure is calculated on an area basis and then fully charged at so much per acre, then the inducement involved is favorable to the high yield grower. But if the average figure calculated is not fully charged or if the service is established as "free" with a compensating lower price per ton, then the inducement is favorable to the low yield producer, and may actually become a penalty instead of an inducement to the better growers.

Suppose the actual costs are recognized, calculated, and fully charged to the grower on a per ton basis. In such case no downward adjustment of price is involved so there is consequently an appeal or inducement to the grower who looks primarily at the price paid. However, if the costs are not fully charged or again there is established a "free" service, then the price per ton must be lower, the cost is there just the same, but the inducement may vanish.

Providing such a service as mechanical picking of corn on an "at cost" basis—that is, not establishing a fixed fee—is presumably a pleasant and easy way to avoid this dilemma, but it certainly has its drawbacks. It is any easy way—easy way either to neglect to include the indirect costs or get into some fancy arguments if you try to include them. It is also a first class way to provide for misunderstanding and at the same time defeat one of the purposes of contracting as far as the grower is concerned—that of stabilizing price-costs relationships.

Gentlemen, it was not my assignment to tell you what you should do. Your use of financial or material inducement to growers is something you must work out to suit yourself and your growers. However, few if any honest men—be they growers or canners—can successfully argue that there is advantage in not recognizing what we are doing—advantage in hiding our heads in the sand.

## Grower-Processor Relations from the Standpoint of the Vegetable Grower

**By James D. Swan, Jr., President, Vegetable Growers Association of America**

When I was requested to appear on your program I was told that the theme of this conference would be "How can we persuade good growers to contract for our canning crops?" and that you would like to hear "what a professional grower thinks the canners might do to make the growing of vegetable crops for processing more attractive to the vegetable grower." I was also told that the sky was the limit so long as I could achieve it in 30 minutes!

Within my very human limitations I try to be considerate of the other fellow: a half-hour of the collective time of each of you in this audience sums up to something over 250 man hours or an after-tax value considerably over $1,000 or the after-tax net that I should hope to make on 20 acres of Chantenays. Therefore I humbly hope to offer you something of value.

Among the resolutions embraced at the recent Syracuse convention of the

Vegetable Growers Association of America was one that appeared spontaneously on the floor from one of the delegates. It was adopted unanimously after simplification and I read it in full:

"8. Grower-Processor Relations

"The production and processing of vegetables, now a highly specialized industry, owes its rapid growth to the consumer's desire for convenience, quality, uniformity, and appearance, all at a reasonable cost. Continued improvement of the techniques of production, as well as processing and distribution, is a common responsibility of both grower and processor. Both desire a more stable volume of quality vegetables for the processor so as to increase the efficiency of the processing plant, and an attractive market for the carefully planned and grown vegetables of the producer. Processors should assume more responsibility in the development of mutually profitable vegetable crop processes.

"We invite the National Canners Association and State Canner Associations to join us actively in establishing this program as a permanent undertaking."

Let's see what that suggests. The vast revolution in cultural methods on the farm has kept pace with or perhaps even outrun on a coarser scale the technological advances in your own plants. Twenty years ago on our own farm we kept one full-time blacksmith-mechanic and he was free to leave his shop from time to time and fill in as extra field help on a plow or cultivator. Today on fewer acres but producing somewhat larger tonnage we must keep two very highly trained mechanics plus extra helpers and they are never quite caught up on their work. More than 30 motorized units now handle the 400 some acres of vegetables against less than a dozen then. Now there are six great sprayers some costing in the multiple thousands, against a couple of inexpensive ones then. Dozens of electric motors now power complicated conveyors where nearly none relieved the backwork of carts-and-carry 20 years ago. The hand thinning and row crawling of carrots on hands and knees have given way to sized seed and chemical weeding. The mechanical green bean picker is a reality and few of you will snap corn by hand in 1955.

All this means that abundant cheap hand labor has of necessity for survival by the grower been replaced by expensive machinery and jaw-breaking chemical names with a concomitant host of new problems relating to residue, flavors and quality.

Just as your advertising campaigns have evolved first from the simple printed medium, then to include the spoken word by radio, and now the television picture as well, so now has your procurement of satisfactory raw products become more complex, and equally demanding of greater service if you are to hold your own competitive position. You have to run so fast just to stand still.

For this problem of satisfactory raw product procurement let's examine our possible vehicles into this now highly complex field. As I see it you may use any one or a combination of three:

(1) You may produce your own raw product. It will be unimportant for this examination whether you rent the land you use or pay taxes and interest and maintain its fertility in ownership of fee. The costs would be similar for its use over a period of years. However, this highly specialized machinery I spoke of would be yours to own, depreciate and maintain at some $200 per acre plus housing it if you intend to grow intensive row crops. Annualize that at whatever rates you customarily use and flavor it with about a hundred dollars per acre yearly of fertilizer, spray materials and these other new chemicals plus such labor as each crop may require and you have your base. Select an executive capable of orienting that array of equipment, labor and materials and show a profit, then pay him enough to keep him. He will not be too easy to find. He will have to know something of the old fundamentals of farming plus a smattering of chemistry, biochemistry and physics, be a good mechanic and understand machinery and cost accounting, be a diplomat in handling human relations, and enough of a lawyer to survive the bureaucrats. He will have to read constantly to keep abreast of the torrent of developments in entomology, pathology, soils, horticulture including herbicides, yes and bureaucrats who are always near at hand to tell him such things as the number of square feet per worker his housing must provide. I said pay him enough to keep him and that pay and pension cost must be enough more than the net earnings of the so-called independent farmers to compensate for that vague something that keeps him on his land and which can't be expressed in money alone. Call it the right to make his own mistakes, and they are many, or the vague lift in his heart when the sun breaks under the storm clouds and rims with green gold the straight dripping rows that momentarily he can call his own.

If you choose to furnish these things as a canner, I see no reason why you should not grow your own raw products, provided you are willing to add to your risks of manufacturing and marketing the risks inherent in weather and plagues of pests and diseases. Historically, canning was a byproduct of farming, a means of spreading out the marketing period of an otherwise highly perishable crop. We growers and you canners are so closely related together in the function we perform for the public that it is difficult to say which dominates which. Suffice it here that many farmers became canners and many canners became farmers. The tendency has been heavily slanted toward deep specialization in recent years by rapid technical improvements. Increased dollar investment in equipment forced by diminished labor supplies will probably accelerate this specialization. At any rate the vast majority of the vegetables grown for processing are grown by farmers and sold to canners and most of these crops are grown under contract.

(2) At the opposite swing of the pendulum you can figuratively shrug your shoulders and decide to purchase all your raw products from a comparative few very large and highly specialized farmers who you could assume would provide all the complex functions we have discussed. The contractual relations would have to be quite intimate and such that not only would there be no shadow of a question as to whether you would get the grower's entire production up to his contracted tonnage in times of crop shortage and high open market price but that he in turn would have a known market for the tonnage contracted and produced by him. There are obvious gains and sacrifices for both parties in this relationship. You could operate with lower executive and administrative costs for your field departments in this case, passing on to your growers a part of that saving to encourage further growth in specialization and improvements in raw quality control. On the debit side is the very smallness of the number of your suppliers and the resultant actuarial risks in small numbers. In this respect the grower's risk would be magnified for the same reason. The contract bargaining would depend more upon the intimate relations of mutual understanding and earned faith based upon mutual enlightened self-interest. I know of such relationships and they have worked over the years. Unfortunately they are probably in the minority.

(3) Probably our best approach to persuading good growers to contract for our canning crops is to combine the approaches described before with the following dynamic development of "good growers" for which I offer you a skeleton on which to build your program. Within the contributing area of your plants you will doubtless find many able farmers with vegetable bias or background who would like to contract part of their acreage with you and more if you make it attractive.

How are you going to make it attractive? In some cases there are

some old sores to salve. I needn't dwell on this. Show them that you are sincerely offering an exchange—to furnish them a certain market for a promised quantity in exchange for a lower price than fresh packages might bring—if they found a market. Show them that the processor has developed an organization with personnel that is as well informed on production of raw products as on processing. Too often the processor scarcely knows how the crop is grown, whereas some of the economic and biologic factors of growing the crop are more exacting than those of processing it. The personnel technically capable of this work must also know the viewpoint of the grower, preferably have experience derived from growing the crop itself. He must keep scrupulously up-to-date. The old general recommendations on fertility practices are no longer enough to produce high quality crops economically, and this is doubly true on other chemicals. How many growers understand the functions—and dangers—of Chloro-IPC, of CMU, Malaeic Hydrazide, and 5 Chloro-IPC, and of carbamates and chlorinated Hydrocarbons? Most of us have gone little further than encompassing N, $P_2O_5$ and K and 2, 4-D in its various forms. Cornell is worried about cumulative CIPC effects in the soil. Its time limits of persistence is not yet known. Will it ruin many acres for many crops before we learn to use it and live with it? Will you blame your growers next fall if the Food and Drug Administration condemns a thousand cases of your finished goods because of insecticide residues?

Your director of procurement and his personnel must have these qualifications—and more—he must realize that the grower must have more than the cost of production to survive and grow again. The favorable results of the program I am suggesting are several. You will tend to tie your growers to you as a source of modern information. A more uniform supply will be yours because yields will vary less from year to year. The quality of your product itself will be higher and there is a certain joy in friendly working relationships between processor and grower as between any old firm and its long loyal patrons.

Fail to do these things and your supplies will be erratic. The zig-zag graph they will chart is likely to indicate market-wise that you should have zigged when they zagged. Or if you are proficient in all other respects and techniques but provide miserable grower relations, I forecast that you will soon be forced into the group who grow your own—presumably at much higher costs and more numerous ulcers. Even in this endeavor I wish you well because we are producers too, and I know that if, in addition to your processing, your growing-operations are profitable, then surely will ours be too and those of our canner friends.

In summary please let me cite a few figures that may shed a light from a slightly different angle perhaps than you have considered. I understand that you canners have your sweet corn this year much as we growers have our onions. Dollar corn and six-bit onions are about on a par of degeneration today. Back to the corn, you would still probably be in the red on that crop in 1954 if the grower out of sheer empathy had decided to donate the raw product from his farm or from his department as the case may be. If a 303 can contains 12 ounces of finished raw carrots which came from 18 ounces of grower's delivery, it is clear that the credit to the growing operation at $25 a rough ton would be something under 20 cents a dozen cans. You see, our package costs with labor running approximately 40 percent of the total value added by manufacture leaves the raw product producer as a pretty small target for a whipping-boy when you start to beat down costs. Because it is out of my element I'll not stick out my neck to suggest that it might be a more fertile field to try to reduce your already efficient processing cost of approximately 40 percent or your distribution costs of approximately the same amount. Your raw product producer in assuming the risks of the open field now receives nearly 20 percent of your consumer dollar against less than 14 percent prewar. But he furnishes a better product and usually additional services. Now this is important: you and he are competing against fresh vegetables, and what has happened there? Canned have advanced only approximately 50 percent since prewar whereas fresh prices have doubled. Here again, however, vastly greater services are performed today by the fresh market grower than by his pre-cellophane, prewar organization. It appears that the relative position remains about the same between fresh and processed crop producers with a deterioration of both in real wages or returns since prewar because the index of prices paid by farmers for commodities used in production are now more than double prewar cost and his labor costs have tripled.

Working together, haven't we a tool in the USDA acreage marketing guides to help minimize the ruinous gluts in our various crops that occur from time to time? Just as we are urging our growers to study and follow them, I commend them to the serious study of your various commodity divisions and you executives at policy making levels. The January 1955, issue has just been published covering thorough studies of probable market needs of summer and fall vegetables for fresh market and for processing. Probably no single firm could compile it alone and you have paid for the thousands of economist-hours to assemble it. Is it impossible to use it collectively?

To better our joint and overlapping vocations, that is the aim of every one of you processors, or you would not be gathered here today. Your enlightened raw product producers seek the identical end. Neither of us can long prosper alone. There are radical extremists or a lunatic fringe among growers and also among processors who would injure the other for a temporary advantage. I have not chosen to deal with them here as they can add nothing to improve our lots. They who deny the fundamental symmetry of our joint interests merely fool themselves. We are convinced that working together in just such manner as today's occasion we can manage the problems of mutuality, the human problems of interrelations to match the pace of progress in our technical age.

## Contracts as An Element of Canner-Grower Relations

**By Hamilton Carothers,**
**Office of Counsel,**
**National Canners Association**

On my desk in Washington there rests a sheaf of canning industry crop contracts approximately 10 inches high. While there may not be in that collection the contracts of every member of this Association, there are at least contracts from every canning area of the country covering every crop of significant volume.

You might think that these contracts would make very dull reading. On the contrary, there has been much of interest in this study. The legal language of a canner-grower contract is like that portion of an iceberg which projects above water. With the aid of a little imagination, you can project these contract terms into a surprising understanding of the industry itself—of its scope and dimensions, its extreme variability, and the wide range of its raw product and quality control problems. You can obtain some very vivid impressions of the nature of the canner's relationship with his growers.

We have been asked to convey to you today a few of these impressions. We can do so only within the limitations imposed by the subject matter itself.

In the first place, different crops require different contract treatment. What is an adequate contract for apples in New York may have little relation to contract needs on tomatoes in Indiana. Canning areas and

crops vary in planting and harvesting practices, in the traditional expectations of farmers, in the quality control problems of the canners, and in cannery production techniques. These variations must necessarily be reflected in the contracts themselves. There are also wide variations in the organizational status of the growers with whom you deal, in some cases to the point where you may to some degree be deprived of your individual choice of contract terms.

It is also true that a crop contract must, if it is to be a legally meaningful document, be a legally enforceable document. Under our system of jurisprudence, this can be determined only by the law of the particular jurisdiction in which the parties have entered into their agreement or which they agree to make applicable to their agreement. No two states in which you may have canneries will apply identical common law concepts or operate under precisely the same statutory structure. Such specific problems as the usefulness of bailment type contracts, the sufficiency of contract provisions designed to secure for the canner a lien on the contract crop, or the need for Act of God clauses to protect the canner against impossibility of performance are beyond this discussion. These are questions which can be answered only under the law of your own jurisdiction.

Lastly, and most importantly, it remains for you and you alone to determine the contract terms under which you will deal with your growers. Both legally and practically, this must be the individual decision of the individual canner. It is not the function of a trade association, by directive or by recommendation, to tell its members what its contract terms will be, nor can I, as an attorney, substitute my judgment for your own in your own business operations.

Nevertheless, there may be some value in the comments of an individual who, if he is not disinterested in the canning industry or unfamiliar with its operations, at least has the perspective of distance. What you are asked to do is to engage in a little soul-searching—contract-wise—in the light of these comments. If the shoe fits, you may care to consider whether a review of your own contract is not in order.

Why should these crop contracts be a matter of industry concern?

The first reason is strictly legal. If your crop contract is to have legal significance, it must lend itself to enforcement by the courts. Yet for many reasons, the ordinary common law action for damages is likely to prove itself inadequate. Not only does this remedy become available only after the breach has been suffered, but more often than not the canner faces serious difficulties in obtaining his raw material from other sources, or perhaps even in fulfilling his contract obligations to his buyers. Furthermore, the canner has the task of proving his actual financial losses to the satisfaction of our legal rules—a difficult proposition in most cases—and even a judgment has no value if the defendant cannot pay it.

A canner therefore should look primarily to specific performance for his legal remedy. Under such procedure, the canner seeks a court order requiring the grower to carry out his contract obligations as agreed upon.

But this form of enforcement introduces additional considerations. The remedy of specific performance evolved in the equity jurisdiction of our courts, and, like most equitable remedies, it still carries the stamp of the historical doctrines of fair play and judicial discretion. More than one company represented in this audience has been denied specific performance when a court concluded that its contract was too one sided or lacking in mutuality to move its discretion. Whether, then, your contract shows itself—on its face and not in the history of your dealings with your growers—to be a fair bargain may have very practical consequences in terms of your ability to enforce it.

The second reason why grower contracts should be of general industry concern is one which has been accorded little attention in prior discussions. Perhaps this is so because it makes itself felt on so high a plane that it cannot realistically be considered a problem for the individual canner. But it is surprising how many occasions have produced an active governmental interest, both local and federal, in the crop contracts employed by the canning industry. A congressional committee interested in marketing order proposals may wish to see evidences of the contract relationship between canner and grower. An official of the Department of Agriculture seeking a solution to the diverted acreage problem may solicit sample copies of industry contracts to guide department policy. You all know on how many occasions your local legislatures have been responsive to particular phases of canner-grower relations.

In such instances, the actual contract documents themselves may be a stronger voice in support of the industry's position than all the argument which may be presented. There are substantial advantages to the grower in the industry's advance contract procedures, but unless these grower benefits are plainly shown on the face of the contract, the contract is useless for these purposes. I recall one instance in which a number of contracts submitted to a government department failed even to express a canner obligation to accept the crop. Industry failure to appreciate that a canner-grower contract should be both a political as well as a legal document can have many diverse implications for the industry.

The third reason for industry interest is one which prompted the inclusion of this topic on this afternoon's agenda. The canner-grower contract is the most direct and formal expression of the canner-grower relationship. Such a contract can be either an invitation to deal or a repelling influence—either a positive pole of attraction or a negative pole of repulsion. As Tommy Austern has said, "a good crop contract must embody not only a correct legal statement but some element of salesmanship." Farmers may not be expected, like their cows, to bask in complete contentment, but a contract unnecessarily injecting irritants into the relationship disservices both parties.

I use the word "unnecessarily" advisedly. We are not suggesting here that the answer to the problem of good grower relations lies in elaborate contract concessions. Undoubtedly your grower relations could be improved, at least temporarily, by the simple expedient of doubling your contract price, or by paying more for No. 2 than No. 1 tomatoes, or by supplying all services from seed to delivery without cost. But this would produce only a short-lived prosperity for the growers—when the canner failed to make his appearance for the following production season.

What we are suggesting is that many of the contracts presently employed in this industry leave much room for improvement without such material concessions. Let's investigate what can be done with existing contracts without giving away these contract rights which strike at the economics of cannery production or the canner's ability to compete in selling his products.

The first inquiry you might put to yourself is what you are attempting to do by contract. Fundamentally what you want is the assurance of an adequate quantity of high quality raw material delivered under circumstances adapted to your own processing operations. To insure this, you should acquire by contract certain affirmative legal rights and certain minimum legal protections, all of which should be clearly set forth in the contract in legally sufficient form.

Many industry contracts appear to go considerably beyond this in purpose. Some seem to be aimed at providing in the contract document itself a series of detailed instructions to the grower as to how he shall operate his farm—in other words, to have the contract serve as a sort of reference guide to the grower as to what is expected of him in the way of con-

scientious effort and efficient production and delivery of the crop.

Whether a primarily legal document should be employed for this purpose is debatable. Perhaps your particular crop and area practices are such that the whole of the canner-grower relationship, to the degree it is possible to express it, should be included in the terms of your contract. On the other hand, some are inclined to question whether you can litigate your way into high quality crop production or whether a contract is a proper place for summarizing the legal consequences of a grower's inefficiency, carelessness or failure to cooperate. Some contracts seem primarily to offer a series of thinly-veiled legal threats aimed at frightening—not your regular growers with whom you have a long standing relationship, but the exceptional few who present a grower problem—into becoming first rate producers of crops. Whether the fine print in a contract is an effective method of accomplishing this purpose is questionable.

The failure to appreciate the distinction between these two purposes is apparent in many contracts. If the contract is to serve as a detailed memorandum of understanding to the grower, it should be clear and readable. If the contract is not clear and readable, the terms are there solely to give the canner legally enforceable rights. But when a contract contains both obscure legalisms, which contribute nothing to the grower's understanding of his obligations, as well as provisions which do not lend themselves practically to court enforcement, it demonstrates neither purpose. Such contracts reveal themselves to be more the product of tradition, legal plagiarism, and lack of imagination than of purposeful draftsmanship.

None of you need to be told that a grower's contract is more than an expression of a single purchase and sale. The continuing nature of the relationship between most canners and their growers is such that good grower relations have a commercial as well as a social significance. Few canners can afford to treat their growers as arm's-length bargainers; you have to prove it pays to contract with you over the long haul. In practice, canners recognize and apply these considerations.

Yet many a contract fails to express the true nature of this relationship. Provisions are written in which seem to be the handiwork of lawyers thinking as lawyers alone rather than as canners blending both considerations. I have seen the contracts of two responsible canners in the same area purchasing the same crop for processing into the same product—one of which is readable, pointed, confined to fundamentals and fair on its face; the other employing four pages of fine print, replete with legalisms, overloaded with penalty provisions, and designed apparently to protect the canner against everything from crop failure to ulcers. Yet in practice the dealings between the two canners and their growers are substantially identical and neither is exposed to any unwarranted legal risk.

Specifically, let me offer for your consideration a number of suggestions:

(1) Review your contracts in the light of current conditions. If you are still employing the same contract that you used in 1925, it undoubtedly warrants a second look. As an illustration of how little attention is paid to the provisions of their contracts by some canners, I can point to contracts in use in this industry today which state that the price for the raw material is to be determined by the Office of Price Administration—an agency which ceased to operate in 1946. I have seen others which make reference to the 1944 vegetable subsidy program of the Department of Agriculture.

(2) Eliminate those contract provisions which you do not enforce in practice. I am not talking about those provisions which may be occasionally waived under extraordinary circumstances, but those which your own canning experience reveals to be words rather than regularly exercised rights. These are realistic determinations which can only be made by you as the canner. But, as Marvin Verhulst once expressed it, "a contract with a bark that is worse than its bite" may be costing you in grower relations what you think you're gaining in a delusive certainty.

(3) If you undertake to revise your contract, don't view it as a task for lawyers and lawyers alone. Ominous sounding legal provisions which are more threatening than useful are usually the product of a lawyer's instinct for maximum protection.

A woman recently called the police to report a skunk in her cellar. The police suggested that she open her cellar door and lay a trail of breadcrumbs to the outside. She called back fifteen minutes later to say she now had two skunks in her cellar. You may be only adding to your problems by seeking too much in the way of legal protection. Keep an eye on the big picture and avoid letting isolated incidents in the past history of your company give you an exaggerated sense of the importance of little specifics covering only remote possibilities.

(4) Make a definite effort to keep your contracts readable. Certainly, of all contracts employed in your business operations, those which can least afford the over extensive of legal language are those you present to your growers. Yet there are still a fair share of contracts today in use within the industry which employ the "to wit" and "party of the first part, party of the second part" phraseology.

Samuel Johnson once defined a window as "an orifice in an edifice for the admission of luminous particles." He might better have said "a hole in the wall to let in light." I fail to see why a crop contract cannot designate the grower as the "grower" and the canner as the "canner" or "processor" without affecting their legal relationship.

(5) Don't abuse the use of penalty clauses. If experience teaches you that certain liquidated damage or penalty provisions are necessary to insure grower compliance with certain conditions vital to your operations, they may have a role. But insure yourself realistically of their need.

(6) Minimize the use of "options." A tone can be created in a contract document which makes it appear considerably less reasonable than it actually is—to growers, to your courts, and to governmental authority. Contracts overloaded with provisions stating that "the canner may, at his option, refuse to accept" or "the canner may, at his option, require or not require" can go a long way towards obscuring the contract's good points.

Frequently, this is more a question of semantics than of canner privilege. Let me give you an illustration of how phraseology alone can give a contract an unfavorable tone. Many contracts state that deliveries will be accepted only between the hours of nine to five on weekdays, unless the canner and the grower mutually agree on deliveries outside of these hours. Other canners, processing the same product in the same area and in practice applying the same delivery terms, express this thought in the following language:

"Canner may, at his option, reject deliveries on Saturdays and Sundays or after five o'clock on weekdays."

Repetitive instances of such failure to recognize that the tone of a contract can be significant can give the contract an unhappily negative flavor.

There are other reasons for minimizing the use of options whenever possible. Experience has undoubtedly taught you that price and price alone is not the sole source of grower discontent. When growers are forced to accept innumerable uncertainties in their contract relations, that can become a source of friction. Frequently the exercise of the option creates an antagonism among individual growers which may in the long run outweigh the benefits accruing to the canner.

(7) Accord whenever possible a reciprocal right to the right assumed by the canner. It is particularly pointless to fail to do this when the compensating grower privilege is recognized by the canner in practice. Don't let the historical development of canning industry crop contracts prevent you from expressing on the face of your contract the accepted fact that your contract is a two-way street.

We in the industry may understand that crop contracts have developed in the past principally with an eye to the problem confronting canners. Implicit in every contract is the inarticulated premise that the canner wants and needs the crops contracted for and that financially and in many other ways he has put himself out on a limb in respect to the coming processing season. All too often, however, too much is implicit in terms of the corresponding benefits accruing to the growers. Let your contracts give expression to these grower gains.

These have been generalities. I hope they have been thought provoking. A cynical politician once observed that, in the agricultural field, one of the surpluses which has given us the most trouble has been that of farm leaders. If the canning industry is capable of conveying in its contract terms the true benefits of the canner-grower relationship, it can substantially contribute to the solution of any problems emanating from that source.

## Effective and Accurate Presentation of Crop Statistics to Growers

**By H. L. Stier,**
**Director of Statistics,**
**National Canners Association**

Some years ago H. G. Wells, the famous English historian, made the statement that "a knowledge of statistics would some day be as important as the ability to read and write." The events of recent years indicate that we are rapidly approaching the time which Mr. Wells described. Businessmen and farmers are relying more and more upon facts from figures as a basis for their plans and decisions. Almost daily we read about new management applications of statistical and mathematical techniques like linear programming and probability control. And some of the applications are in the canning industry and in farming. Many canners say that canning crop producers are more conscious of the value and need for statistical facts than the average farmer. Many canners have been of real help to their growers by providing them with useful basic statistics. In other instances canners have not recognized any responsibility in this field.

Most canners have available some statistical data concerning raw product production costs, yields per acre and total production. Some canners have very detailed records of grower performance; others are fragmentary and incomplete. I believe that every canner, no matter how small, can benefit by maintaining a record concerning each individual grower's performance.

By summarizing individual grower records and making them available to growers, together with other production data for the state and the U. S., the canner provides the starting point for the improvement of individual grower performance. The net result will be greater monetary return to the grower, and the canner will receive a higher quality product.

Perhaps at this point the cynic will be reminded of the old saw "lies, damned lies and statistics." Unfortunately there are statistics desirable and statistics undesirable. The unscrupulous have always used statistics to prove the untrue and to accomplish their selfish desires. Selectivity in the use of statistical data and tricky techniques in presenting them should be avoided like the plague. No can the unwitting use of such procedures be considered as less than unfortunate if not dishonest. For those who would like to avoid the pitfalls of such usage, I suggest that you read the currently popular booklet entitled *How to Lie With Statistics*. This book contains, in very entertaining form, a description of many of the tricks that are used to catch the unwary in statistical traps.

The presentation of crop statistics to growers by canners can be classified under two broad headings: (1) state and regional data which deal with crop acreage, production, yields, price per ton and total value, and (2) local crop data which deal with crop yields on a county or grower basis, production costs for the area, return per acre or ton, relative quality produced by individual growers and experimental data giving the results of experiments in the use of pesticides, fertilizers, various cultural practices, etc. Much, if not most, of the data included in the local series of crop statistics must come from individual canner or grower records. The state and national data are contained in the reports published by the Crop Reporting Board of the U. S. Department of Agriculture.

The Extension Service specialists in the colleges of agriculture use much of these data in grower meetings. I am sure that Extension Service workers would welcome suggestions from canners as to the types of information that should be compiled concerning canning crops and even some suggestions as to its method of presentation. If you as an individual canner feel that such services can be improved in your state, you should encourage the Agricultural Extension Service to assemble such data and make it available to farmers and to use it at grower meetings. Such a practice has a number of obvious advantages. The data are made available from a source that has no particular axe to grind and it provides everyone with the same basic data for discussions and decisions.

The effect of conjecture, opinion, and rumor are minimized when accurate statistical facts are available for analysis and decision.

In preparing statistical data for presentation there are two cardinal principles that should be followed: (1) simplify the presentation as much as possible and (2) make sure that the data are complete and accurate. Presenting statistics in chart form facilitates their use and aids in their interpretation. Relationships and trends can be seen readily in a chart which would require much study if the same data were in tabular form. However, the value of a chart is very frequently lost by adding too many factors in the chart and making it too complex. A good rule to follow is to try to make one point in each chart. Whenever possible, color should be added to statistical charts. Its proper use greatly increases their effectiveness. In reports to growers and in fieldmen's handbooks it is usually desirable to include the basic data in tabular form and to chart these data whenever possible on the same page or the opposite page. The user then can refer to either the actual values in the table or use the chart to quickly ascertain the relationships and trends that exist.

There are available many inexpensive methods of preparing charts. Some of the most effective statistical charts can be made from very inexpensive materials and equipment. The most important factor is ingenuity and the desire to be accurate and effective in presentation. Color can be very effectively used in charts by the use of such commonplace items as colored Scotch tape or colored crayons for bars or lines. Modern methods of duplicating make possible relatively inexpensive duplication of charts in color. Actually color charts can frequently be reproduced at lower cost than printed matter (by letter press).

If a little forethought and care is taken in the initial preparation of charts so that their dimensions will fit the window space in a 2" by 2" slide

(35 mm film), then almost any person who is handy with a camera can make very effective color slides of the charts for use in meetings. For such use charts should be made in the proportions of approximately 9" x 13". This technique provides charts in color that can be projected to almost any size desired at a cost that is very nominal.

The bar chart is generally considered the easiest to understand of the various types of charts that can be made. One of the most useful types is the ranked bar chart in which a series of data are shown in separate bars each ranked in order from the largest to the smallest. This type of chart can very frequently be used in preparing graphic presentations of crop statistics. For example, as Figure I in which the relative yields of tomatoes for canning in the various states are shown as a percent of the U. S. average. The actual yields in tons per acre in this chart are shown in a column and the bar in this instance indicates the relationship to a selected base value—the U. S. average yield. The percentage relationship can be omitted if desired and the actual tons inserted in the bars. The visual impression is identical. In comparing a number of states with an average in Figure I, it is well to show the reference bar (the U. S. average) in either a different color or a different type of cross-hatching if it is duplicated in black. This type of chart tells the user two things very quickly: (1) the relative rank of each state in tomato yields, and (2) its relationship to the average for the U. S. in terms of percent above or below. For example, the average yield per acre in 1953-54 for Ohio was 11.8 tons which was third in the nation and 11 percent above the U. S. average, while New Jersey ranked No. 7 among the tomato producing states and its yield of 9.4 tons per acre was only 89 percent of the U. S. average —or 11 percent below the average.

A comment is appropriate concerning the choice of the 1953-54 average in Figure I instead of only one of the two years. In some of the states the yields in these two years varied considerably due to important differences in weather conditions during the growing season. The use of 1954 in the Northeastern states would have placed them at a distinct disadvantage and would not have very accurately shown the most probable relationship of their yields to the U. S. average and to other states. Combining the two years leveled out these adverse effects due to the weather. For this purpose a five-year period is frequently used for comparing factors which are affected by the weather. A much longer time period is likely to cover up an important trend in yield or some other factor in certain regions or states. A thoughtful selection of the base or average time period is important in insuring an accurate comparison.

A slightly simpler type of bar chart is Figure II which shows the proportion of the total U. S. production of eight major vegetables that was processed in 1954. This chart shows very quickly and simply that peas, with 95 percent of the total production processed, ranked higher than any other single vegetable crop, and snap beans with 57 percent of the crop processed, was No. 8 in the list. In this particular chart the wording of the title should be noted. In this instance the chart is designed to point out to the producer that processors are an important market for vegetable crops. Saying so in the title emphasizes the point and will point up a fact that might otherwise be overlooked. The so-called "story chart" (a series of charts with narrative titles) is a type that can very effectively be used to portray and summarize the highlights of a mass of data.

The simplest type of bar chart is that shown in Figure III where the actual tonnage of vegetables produced for processing is inserted in the bar and the length of the bars represents the relative magnitude of production in each state. These data could have been related to the total production of vegetables for processing in the U. S. and the figure in each bar might have been the percentage of the U. S. total production produced by each state. The length of the bars and the relative differences between them would have been identical. The matter of whether the absolute values or the proportions are shown should be carefully considered in light of the part of the story which the chart is supposed to portray.

Figure IV indicates a little more complex type of chart in which the relationship between total supply and raw product price is shown. Here again the wording of the title was selected in order to show the major point that was to be made in the chart, namely that supply and demand affects sweet corn prices. The chart shows the relationship between carry-

**FIGURE I**

**Tomatoes for Canning**
**State Comparison of Yield Per Acre**
**1953-54 Average**

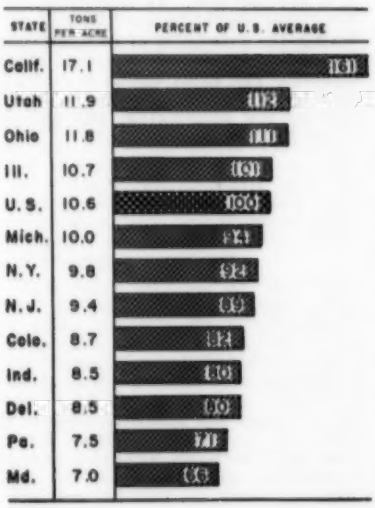



**FIGURE II**

**Processors Are an Important Market for Vegetables**

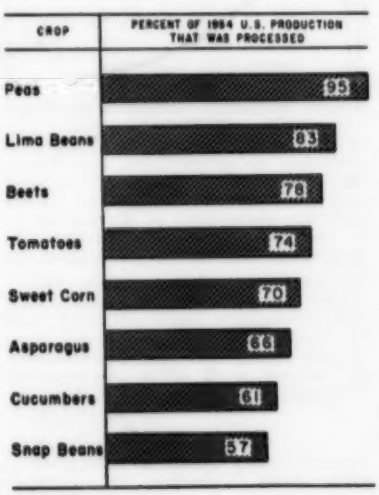



**FIGURE III**

**1954 Production of Vegetables for Processing, by States**

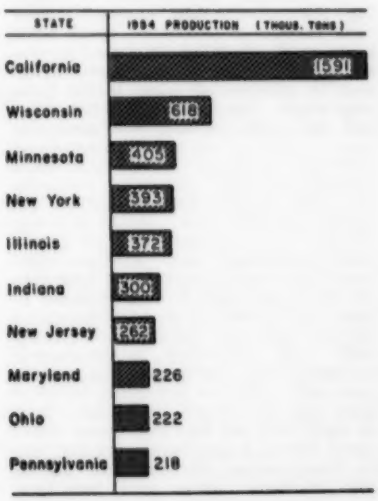
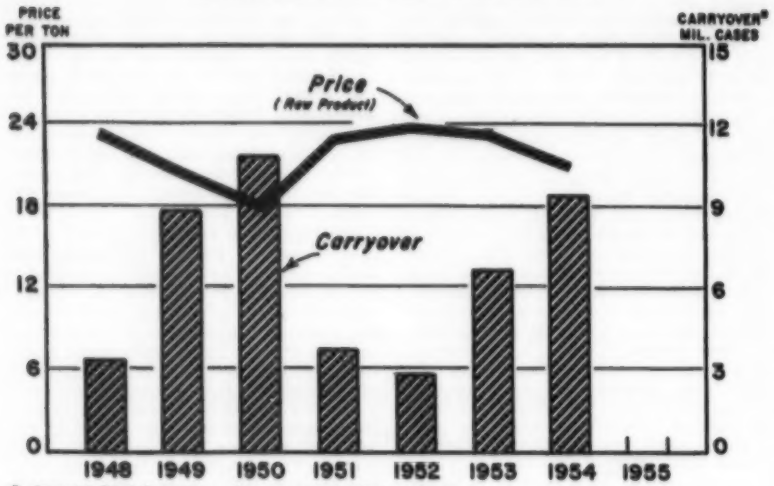


FIGURE IV

How Supply and Demand Affect Sweet Corn Prices



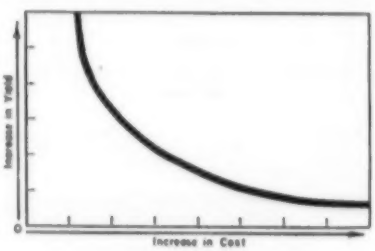

* August 1 Total Carryover — Canners and Distributors Stocks

over stocks (canners' and distributors' total) and the raw product price during each of the last seven years. A technique that is sometimes used to accentuate the changes which occur in one of the factors charted is to expand the scale. For example, in this chart the price scale (on the left of the chart) could have been from 12 to 24 with the 12 replacing the 6 and the 24 replacing the 30 at the top of the scale. This would have had the effect of doubling the vertical distance from the peaks to the valleys of the price line. When such techniques are used it is important that the scale be broken near the base so that it is readily evident that it is not a continuous scale from the zero base line.

The straight line method of charting the relationship between sweet corn carryover and price could have been used. Instead of years across the bottom scale of the chart, carryover in millions of cases would have been used. The 1948 values for price and carryover would, for example, be represented by one point plotted at the intersection of the $23 and the 3 million cases carryover lines. If the values for each year were plotted in this manner, then a straight line of closest fit (regression line) could be calculated and drawn in. This line would then show at a glance the

FIGURE V

Production Costs Go Down When Yields Go Up




degree and kind of relationship that has occurred during the past seven years between the raw product price per ton for sweet corn and the carryover at the beginning of the same season. This type of chart is shown in Figure V where the curved line on the chart represents the average relationship betwen production costs and yields. Here again effective use can be made of the descriptive title "Production Costs Go Down When Yields Go Up." A "topical title" might have been used for this chart such as: "The Relationship Between Yields and Cost of Production." Such a title tells nothing about the kind of relationship nor summarizes in any way the data that are charted.

The canner may frequently find it very helpful to assemble and chart key statistical data for distribution to his growers in booklet form for use in grower meetings. The essence of effective presentation of statistical data, whether for grower use or other purposes, is simplicity. Extraordinary care should be exercised to insure accurate chart presentation and the use of data that are comparable. A detailed knowledge of the data is most important in order to insure accuracy, completeness and comparability. Especially when raw product prices are assembled is there a need for as much detailed information as possible concerning services and materials that are or are not included in the price. Cost of production statistics are perhaps most valid when assembled for a specific area or region that is not too variable in types of farming, soil types, etc.

Fieldmen of the canner should always have at hand for reference the statistical data and charts that are prepared for growers. A well organized, comprehensive series of statistical data can be prepared in a very effective form (including color charts) at a nominal cost. In chart preparation, care should be exercised in following the principles of accurate and accepted practices of statistical chart making. The effectiveness of statistical summaries and charts is limited only by the imagination and energy of the makers.

# AGRICULTURAL MANAGEMENT PROBLEMS

PRESIDING: Mark H. Mitchell, The Larsen Company, Green Bay, Wis.

PANEL DISCUSSION: "The Value, from a Company Standpoint, of a Soil Testing Program and Field Demonstrations in Securing Higher Yields and Higher-Quality Crops"

DISCUSSION LEADER: John G. Martland, Green Giant Company, Le Sueur, Minn.

PANEL MEMBERS: Frank App, Seabrook Farms Co., Bridgeton, N. J.; Ben F. Counter, The Fort Lupton Canning Co., Fort Lupton, Colo.; Eldrow Reeve, Campbell Soup Company, Chicago; M. E. Schellhardt, Stokely-Van Camp, Inc., Hoopeston, Ill.

ADDRESS: "How the Technical Advisory Committee of N.C.A. Is Trying To Solve Some of Our Field Problems"—Alvin C. Moll, Chairman, Technical Advisory Committee to N.C.A. Raw Products Committee; Stokely-Van Camp, Inc., Indianapolis

ADDRESS: "How Greater Utilization of Weather Information Can Pay Off to Farmers and Canners"—James M. Beall, Weather Bureau, U. S. Department of Commerce, Washington, D. C.

## How the Technical Advisory Committee of N.C.A. Is Trying to Solve Some of Our Field Problems

**By A. C. Moll, Chairman, Technical Advisory Committee to the N.C.A. Raw Products Committee**

The Technical Advisory Committee is now working on five projects directly related to field and raw products problems of the canning industry. I should like to point out, however, that the TAC itself does not provide financial sponsorship for research, believing that there already exists a great wealth of potential research activity in state and federal research agencies, and in related commercial interests, which can be directed toward the solution of our industry field problems. Also within our own industry, numerous companies maintain agricultural research and development programs for their own purposes. Many problems of an industry-wide nature do not lend themselves to solution by these individual companies, but are the kind which can be effectively undertaken by the combined industry group. The membership of the TAC consists of men who are in agricultural research, or in raw products management positions in the industry. Their technical training and intimate contact with raw products and field problems qualify them for aggressive participation in the committee projects.

Five subcommittees of the Technical Advisory Committee are active on these projects. Each subcommittee consists of four or five TAC members, especially qualified for participation in the project, who will follow that project to completion. This type of organization and the "project" approach to the study of crop problems insures intensive and continued pressure on those who are cooperators with the industry on these projects.

The TAC actively cooperated with the New York State Canners and Freezers Association, Inc., and the manufacturer of the mechanical bean picker in the development of agronomic performance specifications and the evaluation of machine performance. In its cooperation with the manufacturers, the TAC assumes no responsibility other than the "agronomic evaluation" of the equipment and the definition of industry needs so that the developers can be guided accordingly.

As a part of the work with the bean picker, the TAC developed specifications for the use of bean breeders in developing new varieties required by the picker, including quality and varietal type definitions. It also met with snap bean breeders for the interpretation of industry requirements. This has given breeders a clearly defined objective, backed by industry status, so that breeding goals can be set with reasonable confidence.

"How do committee projects originate?" is a natural question. Many TAC projects originate within the committee, expressing needs for research and development on industry-wide problems which have not been solved and which are too extensive to be solved by individual canning companies without the cooperation of the related industries also concerned.

Two such projects are suggested which are closely related and which stem from the single proposition that crop production ultimately must be precisionized and be responsive to management skills to a degree not presently possible or even expected by management.

### SEED QUALITY

Very little is known about the performance of individual seeds when planted or the development of the individual plant from the seed as affected by plant spacing, plant populations, cultural and fertility conditions, soil types, and moisture supply. All these and more must be known and predictable if crop production is to be precisionized to the requirements of the processor.

To aid in finding a solution to this problem, the TAC has established enthusiastic cooperation with a committee from the seed trade, representing major suppliers of processors' seeds, for cooperative study of the measurement of seed vigor, and individual seed and plant performance. The first objective is to develop means of predictive performance before planting, and this will undoubtedly be followed by research on the causes for variable seedling performance leading to an appraisal of the seed production factors which result in performance variability, other than simple germination percentages.

These committees have for two years jointly written, conducted, and gathered data on uniform laboratory and field plot trials which confirm the predictability of performance. More work needs to be done before a workable proposition is possible, and the committees are undertaking to promote seed quality research with this objective. Already, state associations are asking for this work in their respective states, with interest being shown by some agricultural experiment stations. The cooperating TAC and seed trade committees have been in contact with USDA research officials and a new project in pea seed quality research has recently been inaugurated at Beltsville, Md. The present program within the industries is to be continued in 1955. The mutual confidence shared by the seed trade committee and the TAC has, in our opinion, developed a sound foundation for ultimate improvement of seed and, even more important, the

effective use of that superior seed by our processing crop growers in the production of better crops and higher quality at lower cost.

### Precision Vegetable Planters

Concurrently, the TAC approached the farm equipment industry, through the Farm Equipment Institute, asking for seeding equipment which would place seed in the soil in exact positions. This is the "precision planter" project, which seeks the replacement of the presently available drills and planters which are capable of very little precision in the placement of individual seeds in relation to each other or to depth or fertilizer. We have preliminary, but very encouraging information on the responses which may be expected from precision planting.

With the cooperation of the Farm Equipment Institute we have gained the active participation of two major farm equipment manufacturers who developed, built, and placed in the hands of the TAC, several research models of precision planters for field tests in 1954. This will be expanded in 1955, with plans to obtain the active participation of state association raw products committees in supervising field tests. One state association (Wisconsin) has already appropriated funds for three years of experiment station research in plant spacing, populations, etc., utilizing the experimental precision planters.

We are looking forward to continued investment by the farm equipment industry in new equipment for canning crop production, and the continued participation of the TAC in its development and evaluation under field conditions.

### Row Crop Spraying

During the past several years great development in new fungicides, insecticides, and agricultural chemicals has generally occurred. However, there has been little change in the past 50 years in the basic methods of application. In many cases these are cumbersome, slow and costly. The TAC reviewed the situation and concluded that it would be necessary to promote basic research in coverage and application methods before progress could be expected from the makers of spraying equipment for row crops.

This idea was favorably received by research groups in New York and in Ohio, as well as the USDA at Toledo. Through these contacts, and by cooperating with those state associations, a great deal of work is now under way. The New York association has provided financial sponsorship in that state, and new equipment has been built.

The USDA has responded by increasing the tempo of its work, and this winter, in addition to the Ohio schedule, is conducting tests in Florida with air blast spraying of tomatoes.. The interest of plant pathologists at a number of experiment stations has also been aroused through meetings with the TAC, and new research projects have been initiated on this problem of securing basic data on the relationship between spray coverage and disease control.

### Mobile Viners

A mobile viner subcommittee has been functioning in the evaluation of the performance of new vining equipment. Again the TAC noted a dearth of progress and recognized the great opportunity and need for a reduction in the cost of harvesting and threshing peas and lima beans. It made its services available to all viner manufacturers and upon request has actively served in testing developmental models of one manufacturer. As a result, several mobile machines will be in the field test stage this season. Another viner manufacturer has accepted the offer of the TAC to assist in the evaluation of performance, and it is expected that active cooperation will begin during 1955.

### Fruit Problems

Youngest of the TAC subcommittees is the one on fruit problems. Extensive research data have been accumulated in both fruit production and marketing, but there is a distinct absence of research in some areas on problems which specifically interest fruit processors, or a lack of consideration of the processor's viewpoint in planning research. The fruit problems subcommittee proposes to provide cooperation with state association groups in developing suitable recognition of processors' interests in fruit crop research.

As a preliminary to this work, the Raw Products Research Bureau has made a survey of fruit crops research projects in the United States. Already several problems have been noted by this subcommittee as worthy of special attention by state association research committees, and it is expected that more will follow.

The TAC reports to the Raw Products Committee, which is responsible for giving policy guidance to the TAC. The Raw Products Committee has adopted a resolution encouraging appointment by state canners and freezers associations of active raw products committees. Where they are now active, such committees have been most helpful in conferences with agricultural research institutions, and effective partners in projects in which the TAC is active.

The Raw Products Research Bureau has worked with the TAC to the extent permitted by its regular program of activity. For the most part, members of the TAC have been actively responsible for their respective projects, each having participated in numerous meetings, field trials, and in the preparation of data and reports. Their work has been contributed by their respective employing companies so that the potential solution of field problems affecting the industry may be found as promptly as possible.

## How Greater Utilization of Weather Information Can Pay Off to Farmers and Canners

**By James M. Beall,**
**Weather Bureau, U. S.**
**Department of Commerce**

It is with some temerity that I address this technical group of the National Canners Association today, because I know that many of you people know far better how weather affects your specific business than I do. If we have time after the session I would be delighted to talk with you about your individual problems.

The topic that I am to discuss is how better weather service would pay off in dollars and cents. I think before we get into the meat of the talk we had better develop some points of reference and maybe define some things. The first thing I want to do is give you some background on the Weather Bureau and its relationship to agriculture in general.

In 1940 the Weather Bureau was transferred from the Department of Agriculture to the Department of Commerce. This action was taken after assurance was given that the service to farmers would not be diminished. During the war years the weather service emphasis was given to military and civil aviation programs. Much of what we learned during these years has had some agricultural applications but because of the emphasis on aviation during the immediate postwar period and the emphasis on reduced governmental expenditures the service to agriculture has not developed as was expected.

Early in the present administration the Secretary of Commerce appointed an advisory committee on weather services. Their report, issued a year ago, entitled "Weather is the Nation's Business," specifically recommended that the Weather Bureau follow its basic legislative authority "to make such special weather observations, reports and forecasts as are required for safety of aerial and marine navigation in the United States, its territories and possessions, and to provide such special weather information as is required by individual farmers."

Now maybe we had better talk about what the Weather Bureau is doing

now in the way of service to farmers. I find that there is a great deal of variability in emphasis on the service program as I visit our offices in different parts of the country. Those stations on the Great Lakes are interested in the lake shipping; those on the sea coasts in the ocean shipping; those at airports in the service to aviation interests; those in the urban centers in urban problems; and finally, those in rural locations in farm problems. Another facet to this complex of variation of service is the background and interest of the leadership of the local Weather Bureau office. The old saw, "you can take the boy off the farm but you can't take the farm off the boy," is entirely to the point with respect to meteorologists. We can train a young physicist or engineer to forecast weather elements but it takes actual farm experience to understand the importance of how the weather is related to the production of food and fiber. One of our outstanding meteorologists in charge of an office in a large metropolitan area gives real service to the farmers in his area above and beyond the actual demands of his station because they didn't get the farm off the boy. One important phase of my work is to conduct an educational program within the Bureau to heighten the feeling of responsibility to the farm folk that our Weather Bureau offices have.

I have talked in a general way about the service responsibilities of the Weather Bureau. The next question is "just what is the Bureau doing for agriculture now?" Our program exclusively devoted to agriculture is our fruit-frost warning service. It operates in the fruit regions of Florida and California in citrus; Oregon, Washington and Idaho in apples; and in Wisconsin and Massachusetts in cranberries. All our other services are an integral part of our station programs sandwiched into the myriad of other duties and they include forecasts for maple sap runs, orchard spray forecasts, cotton spray forecasts, dew and wind forecasts for aerial applicators, tobacco curing forecasts, frost warnings for alfalfa seed growers, lambing forecasts in our western areas, hay drying forecasts, cauliflower picking forecasts, and so on down the list. The Bureau provides other services for the farmers through the issuance of state and national crop weather bulletins. In one state the bulletin includes growing degree day data for 20 localities.

While I have not exhausted the list, I think that it gives us an idea of what the Bureau is doing. We hope to do more.

When I was given this assignment as agricultural meteorologist about two years ago we sized up the job at that time to be in three phases:

(1) Find out what the farmers' requirements are, (2) plan a program designed to meet these requirements, and (3) do it.

Our survey in phase one showed that the operational requirements can be summed up in one sentence: "The farmer wants weather information as far in advance as possible for his farm at the right time of day and in language that he can understand."

We are in phase two now, developing plans to implement this requirement, and I am happy to report that we have started on some of phase three. Probably the biggest single thing we have done was the institution of the third day agricultural outlook last year. We hope to get our five-day forecast out on Monday, Wednesday and Friday this year instead of on Tuesday and Friday as we now are doing.

Let's first talk about strategic planning, planning for the season, for next year. A little later we will talk about tactical planning, the job for this week. For strategic purposes we would like to have a seasonal forecast. The economic implications are terrific. Some are attempting this type of forecast now. We are not and will not until our skill gets better than it is now.

We do have a gold mine of information hidden in our climatological records. By using these averages of the past, management can make a better guess than the farmer that is just rocking along like Pa did.

Let's look at three examples. First, hay-forage crops. It's our number one crop in this country. Yet I saw the other day that losses estimated at $555 million occur annually due to improper curing of this crop alone. What to do? The men at Iowa State College got together with our climatologist there and asked him to dig out the probabilities of how many years during the normal hay drying season three good days of drying weather in a row could be expected out of ten years. The answer was so discouraging that Iowa State College has recommended that the first cutting be put up as grass silage or be mowcured.

Another example of how climatology can be applied to specific crop planning is exemplified by the work of Dr. C. W. Thornthwaite when he was at Seabrook Farms in New Jersey. One of the important problems any food processor has is scheduling the work so that the canning and freezing will be done at the optimum time. Too much produce on hand creates extra expenses for extra shifts. The quality of the food packed is poorer and it creates an undersirable situation. Dr. Thornthwaite studied this problem with the other specialists. Of course the idea of heat units is at least 50 years old but they worked it out for their specific problems. One question to be answered is how many days out of 10 should be scheduled as non-work days in the field because of inclement weather. As I recall the figures, normally 3 days in 10 must be counted out. This may turn up as 4 days in a row, followed by 10 days of good weather and then 2 days of rain and 5 days of good weather, etc., but the basic flexibility must be built into the production scheduling plan. Another problem that they have worked out in scheduling production is how to adjust the planting dates when it is impossible to get into the fields because they are too wet to work. This is done by the gimmick of having varieties of peas which have different heat unit requirements. If your basic variety takes 1,900 units and you should plant April 13 but you can't get into the fields, another variety with 1,800 heat units between planting and maturity can be planted 4 days later if the daily heat units are accumulating at the rate of 25 per day. Another specific problem that he worked on was the problem of water requirements of the plants in terms of what the average irrigation requirements would be.

Another important example of the use of weather records in the strategic planning is in connection with supplemental irrigation. Last year 4,000,000 linear feet of extruded aluminum pipe was sold for use in supplemental irrigation. Whether or not you should irrigate is a very complex problem and there are many factors other than weather alone which must be considered before the producer decides to invest his money. Buried in our records are some very basic answers as to the frequency of years in which supplemental irrigation can be used with profit. You can ask your Weather Bureau man to give you the figures on how many years out of 10 the rain will not exceed a certain value during the crop growing season and he can supply you the answers. You can ask him also how many years in 10 no rain occurs for periods of 5, 10, 15 and 20 or more days, and he can supply you with the probability of this occurrence. Many other variations on this general theme are available if you can tell the weather man what to look for in his weather records.

These three examples indicate how weather probabilities can be used for the long-term strategic planning in farm operations with profit. Certainly the farmer in Iowa who puts his first crop of hay up as grass silage over the years will get more food value for his farm animals than the man who attempts to dry hay. The packer or canner who schedules his production based on the average weather records will have a lower cost per unit than the canner who schedules his production "by guess and by golly." You can beat climate with seasonal forecasts when they become available. Finally, the farmer who purchases his supplemental irrigation equipment on the basis of the probabilities of rainfall in his area will know exactly how many years it will take to write off his equipment, whereas the farmer who

purchases supplemental irrigation equipment without thoroughly investigating the cost benefit ratio may find himself with a white elephant on his hands.

The second general category that I want to talk about is tactical planning. We're now talking about forecast information that is available. The Weather Bureau issues monthly outlooks around the first and 15th of each month. These have been widely distributed in map form by various news publications. They are carried by many press wire photo services as a map in many daily newspapers over the country. These forecasts are made in terms of expected weather anomalies. Temperatures are forecast in categories of much above normal, above normal, near normal, below normal, and much below normal. These categories are determined by examination of the normal temperatures for the specific area taken from 30 years of record. The mechanism used is for the average monthly temperatures to be arrayed from high to low on a frequency distribution chart. This frequency distribution curve is broken down into the extremes which occurred one-eighth of the time each, the balance of the curve is broken into quarters so that near normal represents temperatures that occurred near the mean one-fourth of the time, above normal and below normal are those groups of temperatures which occurred one-fourth of the time above normal and below the normal, respectively, and the much above and much below categories have only occurred one-eighth of the time. For example, in Chicago for the month of February the average temperature is 24.7° F. One-fourth of the time the monthly temperatures fall within the range from 22 to 26°. If the monthly temperature is within this bracket we say the temperature is near normal. If the temperature falls within the limits from 19 to 22°, which occurs one-fourth of the time, we say the temperature for the month of February is below normal. On the upper end of the scale, if the temperature varies from 26 to 31°, we say that the temperature is above normal, but if the monthly temperature for February is above 31° it is categorized much above normal, and any time the monthly temperature drops below 20° we say that the month has been much below normal. In a similar way the rainfall is categorized by dividing it into thirds. If the Chicago rainfall for the month of February is less than 1.52 inches, it is considered to be light. If it falls within the range 1.52-2.23, it is considered to be moderate rainfall for the month of February, and finally, if the precipitation is more than 2.23 inches the rainfall is considered to be heavy for that month.

Our experience has been that our monthly outlooks are better than the climatological averages. They are better than flipping a coin. They are not as good as we would like to see them. The inherent reason for their being better than climatological averages is due to a factor which we call persistency. We know that if we use the observed conditions in July as a forecast for August that it will verify 6 times out of 10. In other words, the conditions that occurred in July tend to persist in August. If we have been having a dry July, chances are that we will have a dry August. This relationship is highest in the summer months and does not hold up during the winter months. Where the forecasters show skill is in being able to predict changes. However, the fact remains that these forecasts are better than using climatological averages. With the forecast for any given month in mind, the farmer must then think in terms of, "how will above normal temperatures and below normal rainfall affect my operations and how can I use this piece of information to advantage?" We are in the weather forecasting business and not in the farm management business. These are questions you must answer for yourself.

The next type of tactical planning information is our 5-day forecast. Here we can show considerably more skill than we do in our monthly outlook. Our verification system is a good deal more stringent than the verification imposed by farmers. Our forecast is considered to be bum if on Tuesday we predict rain on Thursday and no rain occurs. However, the farmer, hearing a forecast on Tuesday morning that rain will occur on Thursday, is entirely happy if the rain begins to fall on Wednesday evening or if the rain does not begin to fall until Friday, both of which cases we consider by our scoring systerm to be total failures. In general, we do very well on forecasting the trend of the weather, but our timing is often not as good as we would like to see it. Here the applications of tactical planning are much more obvious. A farmer has a choice of several types of activities to do during the next 5 days. If he can on Tuesday morning plan to do his dry weather work first before an expected rain on Thursday and to do wet weather work Thursday and again if clearing weather is expected over the week end, he can use this material to decided advantage. At the present time we are issuing 5-day forecasts twice a week on Tuesdays and Friday mornings. As a result of the President's budget recommendation we are hopeful that funds will become available to increase the number of five-day forecasts a week.

The implication of the daily forecast is obvious and I don't need to dwell on that. Again, the matter of forecast reliability comes up. Our daily forecasts verify about 85 percent of the time. This means that one forecast in 7 will not verify. We know this is not good and we are constantly making efforts to better our forecast skill. We have been working with the Institute of Advanced Learning at Princeton to develop techniques which will be suitable to utilize the high-powered, electronic computer. I am happy to report that beginning next month we are starting on a limited scale to do forecasts with these large electronic computers. How soon routine forecasts will be made by the electronic computers is problematic, my conservative estimate would be within two years these giant electronic brains will be grinding out forecasts with as much skill, or perhaps even more, than those made by our present-day forecaster.

One of the advances that we were able to make during the last growing season was the institution of the third day agricultural outlook on a routine basis over the whole country. This progressive step forward was made with reservation on the part of some of our forecasters but in general we are quite pleased with the results of our forecasts during the last growing season.

When I first started talking, I mentioned that each one of you probably knows more about how weather affects your business operations than anybody in the Weather Bureau does. This is because you are specialists in farm management and we are specialists in weather. If you can define your problem in terms of weather variables we are in a position to help you with a solution of your management problems. This brings me to my final point, that of communications. How many of you have looked at your watch and then had someone ask you what time it was, whereupon it was necessary for you to look at your watch again to see the exact time? This illustrates a point in communications that is very important in the field of agricultural meteorology. When you looked at your watch you were interested in how many minutes you had before a certain appointment, or how much longer you would have to sit and listen to this boring speaker, or something of that sort, rather than the absolute value of the time in the frame of reference of hours and minutes in a day. Here is where we get into difficulty in giving forecasts to farmers. By and large they don't care what the relative humidity is going to be, they want to know whether their hay is going to dry. They don't care what the value of the wind will be, they want to know how the wind today is going to affect their cultivating practices. We have been forecasting relative humidity and temperature and rain or no rain for a long time and by and large I think we do a very good job. The question comes up then, should we concern ourselves with the farm management problems that are obviously in the area that our forecast covers? My answer is that, yes, we

should concern ourselves with the applications of our forecasts, and my answer is predicated largely on the basis that where we have done the most good is in the areas where we have concerned ourselves not only with the specific meteorological parameters involved such as low temperatures in the citrus groves, but with some of the physiological factors involved in how the minimum temperatures affect the orange plants. The same is true with our cranberry forecasting service. Support has developed for the Weather Bureau program when we can tell the farmer what to do in terms of the expected weather conditions. We are making efforts in this field to expand our service but unfortunately we don't have enough trained personnel to go around at the present time. My feelings is that the Weather Bureau now has available a great deal of information which, if digested and given to the farm audience in terms that they can understand and on which to base their management decisions, the farmer will get more for his tax dollar than he is now.

Last year we conducted an experiment in cooperation with the University of Kentucky Extension Service in connection with burley tobacco curing. In the final report of this project a statement was made that the cost benefit ratio of this experiment, if applied statewide in Kentucky, would be $100 in the pockets of the farmers for every dollar spent by the Weather Bureau. In terms of dollars, the Extension Service estimate was that the farmers of Kentucky would benefit in the order of from $3 to $5 million if this service could be instituted on a statewide basis. Here we solved the communications problem by having the Weather Bureau forecaster make the forecast of the weather variables in which the tobacco growers are primarily concerned, that of wind and relative humidity for the next day. This forecast was then given to the Extension Service and translated into the actual management decision: open your barn doors at 2 o'clock today, close them an hour after sunset, being heating tomorrow morning, and continue all day tomorrow. I realize that there are some objections to having government bureaucrats mastermind the operations of an individual, and I heartily agree. Someplace there is a middle ground. I would be among the first to admit that the forecast information now available to the farmer is too technical and not easily translatable into "how does this affect my farm operations?" On the other hand, I don't feel that the Weather Bureau should be in the business of telling the farmer when to open and close his barn doors, because one day we might tell him to do the wrong thing and the final analysis of management decisions have to be based on a good many variables other than the weather alone.

Of this I am sure: when the Weather Bureau provides the farmer with weather information as far in advance as possible for his farm at the right time of day and in language that he can understand, it will put more money in the farmers' pockets.

# EFFECTIVE MANAGEMENT OF MARINE FISHERIES

## —When Is It Necessary and How May It Best Be Accomplished

PRESIDING: Arthur H. Mendonca, Chairman, N.C.A. Fishery Products Committee; F. E. Booth Co., Inc., San Francisco

ADDRESS: "The Biologist's View"—Dr. Clarence P. Idyll, Marine Laboratory, University of Miami (Florida)

ADDRESS: "The Sportsman's View"—Henry Lyman, Publisher, *The Salt Water Sportsman*, Boston

ADDRESS: "The Commercial Fisherman's View"—John J. Real, Fishermen's Cooperative Association of San Pedro, California

The Biologist's View

### Effective Management of Marine Fisheries—When Is It Necessary and How May It Best Be Accomplished

**By Dr. Clarence P. Idyll,
Marine Laboratory,
University of Miami**

In order to answer the question posed—"when is management of marine fisheries necessary and how can it be best accomplished?"—it is necessary to define terms. The term "management" is the first one requiring definition, but to define management it is first necessary to have a clear understanding of three other terms, namely "depletion," "overfishing," and "conservation." These three words, as they apply to fisheries, are closely interrelated, the meaning of one depending on the proper use of the others.

An agreement as to what constitutes "depletion" is basic to this whole discussion, and here is a place where a great deal of confusion and disagreement occurs. Part of the confusion results from the fact that there are two different legitimate definitions of depletion, one economic and one biological, and these may be conflicting.

The economic definition of depletion says that it takes place as soon as it becomes unprofitable to fish—when the cost of boats, supplies and fishermen's shares is more than the income from the catch. It is obvious that the point when depletion takes place, under this definition, varies with the price of fish and the cost of catching them as well as with the abundance of fish. It is possible for a fishery to be depleted, economically speaking, during a period when fish are relatively abundant, if it is impossible to sell the catch. Later when there is a demand for the product and prices are higher, the fisherman can make a satisfactory profit with the same small catches.

Biological depletion can be defined as occurring when a fish stock has been so reduced that it yields less fish, by weight, than it is capable of doing, year after year.

Now the question of what the stock is "capable" of yielding must be examined. An unfished virgin stock of fish will yield a bigger catch than a stock which has been exploited for a period of time, but this larger yield is only temporary. After the fishery has been under way for some years, at a reasonably constant rate of fishing, the yield will stabilize itself at a lower level than during the first year of fishing. What the level of this stabilized yield turns out to be will depend on the intensity of the fishing and the balance between the growth and death rates of the fish. There is, for each population of fish, a theoretical density, a theoretical level of

abundance, which will yield the greatest steady production of fish over a long period of years. Biological depletion occurs when overfishing (or some other factors) reduce the abundance so that this optimum steady yield cannot be realized. Biological depletion occurs frequently—or perhaps usually—at a different level of abundance than economic depletion. Thus, a fishery enjoying a good market may make a profit and thus not be depleted economically while catches are very low as a result of severe biological depletion.

If we accept this definition of biological depletion, it is easy to define "overfishing" and then to proceed to a consideration of conservation. Overfishing would seem to be the rate of fishing which reduces the abundance of a fish population to the point where it yields less than its optimum. Then "conservation" would be the establishment of the level of fishing that would ensure that the optimum yield was realized year after year.

It is important at this point to realize that control of the fishing rate may involve the encouragement of the fishery instead of the imposition of restrictions. This emphasizes the concept of underfishing, which, under the modern idea of conservation, is thought to represent as much a waste as does overfishing. There is no such thing as underexploiting a mineral resource because the copper or lead will be there to be mined 50 years from now if it is not removed this year. Fishery resources are different, and require a different concept of conservation. If fish are not caught, in a very short time—usually in not more than a few years and frequently in only a few weeks—they die or are killed by predators and are lost as human food. This does not mean that it is proper to catch all the fish in a population to avoid losing them, because some must be left for reproduction, and the nice balance that must be struck between overfishing and underfishing is what makes fishery conservation so difficult.

Only now is it possible to accomplish what we set out to do earlier—to define "fishery management." This may be said to be the manipulation of fishing effort to ensure that the population yields the maximum possible amount of fish, by weight, not for one year only but permanently, and to ensure that the fish arrive on markets when they can be best absorbed. Good fishery management should involve encouragement of increased fishing effort if underexploitation can be proven and if markets exist for more fish. It should also be prepared to impose restrictions on fishing where overexploitation can be shown to exist. But this should not be its sole function.

I have now given an idea of what I believe effective fishery management to be, and in doing so I believe I have partially answered the second part of the question, "when is management necessary?" It should be clear from the argument so far that management is necessary whenever a stock is yielding less than the maximum of which it is capable. If the yield is below the optimum because of underexploitation, then management involves the discovery of new fishing grounds through exploration and the increase in catches through the development of new ways of detecting and capturing fish. If the yield is less than maximum because of overfishing, then management is again necessary and

CLARENCE P. IDYLL

some methods of reducing the fishing rate must be found.

This brings us to the last and by far the most difficult part of the problem, "how can effective management best be accomplished?"

Let me repeat two sentences from what I have said so far: "Good fishery management should involve encouragement of increased fishing effort if underexploitation can be proven. . . . It should also be prepared to impose restrictions on fishing when overexploitation can be shown to exist."

You will immediately recognize the joker in these statements. They insist upon proof of the condition of the fishery before control is proper, and the proof is always hard to achieve. It will not be difficult to convince you, as producers and processors of fish, that the fishing industry has frequently suffered severely and unnecessarily because of restrictive regulations, imposed without proof of their need. Reduced catches are not necessarily proof of depletion; lower catches per boat or per man are not necessarily proof; the pained outcry of opponents of all kinds of commercial fishing or of opponents of certain types of gear is not necessarily proof either. The proof comes only through the painstaking methods of science, the careful analysis of production records, and the unraveling of the complexities of the biology of the fish themselves. The tools for these studies have improved greatly in the last three decades, and are increasing at an accelerated rate, so that we can afford to insist more and more on adequate proof of need, before restrictions are placed on fishing activities.

Let us suppose that we have proven depletion to exist, through adequate scientific study. What devices are available to manage the fishery, in order to restore it to the optimum level and keep it there? The methods used include closed seasons, closed areas, size limits, mesh limits, catch or bag limits, and gear restrictions. These are all variations of the one basic method—to reduce the fishing effort. Some are better than others, and which one or which combination is used will depend on circumstances. Direct catch regulation, controlling the quantity of fish caught, has been declared the best method by competent biologists, but for successful use it requires a degree of understanding of the biology of the fish and of the dynamics of the stocks that has rarely been achieved. A minimum size limit, usually accompanied by mesh regulations, is also a valuable regulatory method, but again its proper application depends on a high order of scientific achievement. Closed seasons are particularly useful in regulating salmon fisheries but are less valuable for some other species. Closed areas are much less useful than has been generally believed. Restrictions on gear, whether of kind or quantity, are open to many criticisms, and have been declared to be among the weakest methods of controlling fishing effort and likely to be least fair to the fisherman as well as least effective in achieving their purpose.

I have emphasized that the decision as to whether a fishery needs restrictive regulations in the first place should depend upon careful scientific analysis, and not be determined by emotions or selfish opinions. It is equally important that the type of regulation should be decided on a scientific basis.

If the principle is borne clearly in mind that fisheries must be managed for the benefit of the fisherman and not for the fish; if restrictions are not placed on fishermen without proven need; if regulations when they are shown to be required are devised with the aid of the best scientific information available, then I think we can say we have devised effective management, and have pointed to the way it can best be achieved.

The Sportsman's View

# Effective Management of Marine Fisheries—When Is It Necessary and How May It Best Be Accomplished

By Henry Lyman, Publisher,
The Salt Water Sportsman

Sport fishermen are a peculiar breed. I know not only because I am one, but also because I talk to thousands of them, argue with them, swap correspondence with them, and just plain fish with them during the course of a year. If two salt water anglers gather in one spot, it is almost a certainty that there will be two entirely different opinions on effective management of marine fisheries. If the number in the gathering grows, the opinions are apt to grow by a direct arithmetical proportion.

Let me take one example from many to illustrate my point. In Massachusetts the major sport fish is the striped bass. Surf fishermen forsake their families, forget their jobs and get a wild gleam in red-rimmed, sleepless eyes when the run is on. Since the run lasts from spring until late fall, these amiable fanatics have become a group unique among anglers. They design beach buggies to travel the sand, sleep in them, live in them, and even go to the extreme of having hot and cold running water systems in the automobiles themselves. From the appearance of most of these surf fishing "regulars," this luxury is used primarily for cooking.

The surf fishing regulars have definite ideas of effective management of the striped bass fishery. The present law in Massachusetts, which makes the species a fish that can be taken by hook and line only, satisfies them. They sell their catch and want no restrictions on sale of bass. As far as commercial fishermen are concerned, they do not care as long as the true commercial's nets are kept clear of striped bass. However, mention to these anglers that they really are commercial fishermen themselves and they will scream to high heaven. They will tolerate the marine biologist—in fact they have even been known to cooperate with scientists—but they will not tolerate the man who suggests that it would be nice to have the striped bass a true game fish—that is, a species which cannot be sold on the open market. Not only will they not tolerate it: they will take every political step possible to prevent it.

Leave the outer beaches in Massachusetts and travel a bit to the north and west. Here you will find another group of eager sport fishermen. Instead of the long surf rod, they are wielding feather-weight tackle from small boats and along the tidal river banks. To the more fanatic of this group, anyone who sells a fish for monetary gain is second cousin to the devil himself. Commercial fishermen are beyond the hope of civilization. Marine biologists are considered a parasitical growth on the state's payroll. To this group of anglers, there is only one answer to any marine fisheries problem: destroy the commercial fisherman, allow rod and reel fishing only for any species that might be considered game, and prohibit by law sale of fish for food. Then and only then will catches be good and anglers be happy.

HENRY LYMAN

To speak for effective fisheries management for all sport fishermen is obviously difficult. When two groups in a single state fishing for the same species cannot agree, it is almost impossible to find agreement all along the coast where hundreds of different species are involved.

If the fishery concerned brings no conflict with commercial interests, the problem is comparatively simple. Take, for example, the tarpon or the sailfish. Both species are considered excellent sport fish. Neither can be considered particularly tasty on the table. Here the sportsman has a free hand. If the supply of fish is low, research and management must be carried out through his own efforts. No one other than those connected financially with the sport fishing economy will worry about the matter. If money is needed for scientific work—and I have yet to see a time when money was not needed for scientific work—it is up to the rod and reel man to raise the necessary funds.

Unfortunately most of the marine species sought by rod and reel fishermen do not fall in the tarpon-sailfish category. Major food fish like the tuna, bonito, weakfish, striped bass and bluefish are commercial prizes as well. And, also unfortunately, it is in these fisheries that the need for management and research is felt most strongly.

I cannot speak for the fanatics. My opinion is only that of one sport fisherman among millions of my kind. However, I am in contact with as many of the breed as any other man on the East Coast. In addition, I have many friends in the commercial fishing ranks. At one time in my career, I even did a bit of commercial fishing myself. Add to this the working knowledge of the problems of the marine biologist and the problems of the legislator. I am no superman, but sport fishing happens to be my business as well as my hobby. The remarks that follow definitely do not express the opinions of a great many rod and reel men. I think, however, that they do express in general terms the opinions of the sport fishermen who realize that the ocean is not their own private stamping grounds, who are willing to discuss rather than to battle and who want to see better fishing for all concerned.

First, when is fisheries management necessary? To my mind, the answer is simplicity itself: it is necessary right now and for all time. By this I do not mean control of the fishing which would impose undue hardship upon any one group. I do mean control of the fishery to obtain maximum yield to all groups without destruction of the fishery itself.

There are some who claim that overfishing of any particular marine species is almost impossible with present methods available. Those who claim this overlook one important item. It is possible that fish of a marketable size cannot be overfished. However, if the young of this same species are destroyed during the process of catching the marketable fish, if the spawning grounds are ruined either by fishing methods employed or by pollution from industry, if expansion of our population removes former natural habitat, I submit that over fishing can, does, and will ruin the fishery.

Good management does not necessarily mean more stringent control. As a matter of fact, quite the reverse is true. When a fishery thrives because of good management, controls are relaxed and all concerned benefit.

I sincerely believe that one of the major steps forward for good marine fisheries management will be taken when the sport fishermen themselves stop standing in one corner throwing bricks at the commercial fishermen and dodging bricks thrown. When the

two groups sit down together, discuss their common problems and are satisfied with a sound compromise, many of the management difficulties will be overcome. I am glad to say that in many sections this attitude of cooperation already is apparent. After all, both groups are interested in one thing fundamentally: better fishing. The sooner they cooperate, the sooner the goal will be reached.

Effective management of marine fisheries is very easy to talk about, but it is not so easy to accomplish. One very necessary ingredient is the marine biologist. In the past, the sport fisherman took a very dim view of the marine biologist. It is not difficult to find the reason. Sport fishing as an industry or business had no money and little voice politically. Therefore, the good marine biologists worked for the commercial fishermen or for the interests connected with commercial fishing. Research, which is sorely needed on the ocean front, was slanted naturally enough toward the commercial interests which footed the bill.

Today this has changed considerably. Since World War II, the number of anglers who turn to the sea for their sport has almost doubled every year since 1946. This means that sport fishing has become big business along the coast. A survey conducted recently by the Fish and Wildlife Service—a survey which is in the process of being published—shows that marine sport fishing in the New England area alone is a multi-million dollar business each year. As a matter of fact, in certain sections, it has become of greater value by far than the commercial fishing industry.

This of course means that the sport fishermen are making themselves heard, which in turn means that the marine biologists are being employed by groups sympathetic to the sportsman's views. I do not mean to imply that any research man will slant his findings toward the opinions of his employer. No good research man would consider this. However, if a man is hired to study the channel bass, his findings are of interest primarily to the sportsmen. If he is hired to study the Atlantic herring, his findings are of primary interest to the commercial fisherman.

Management depends upon research. So little is known about marine fisheries that the research needed reaches astronomical proportions. A dab of study here and another dab there will not do the job.

It must be a coordinated effort of long-term proportions to do any good. Obtaining such an effort is not as difficult as it may seem at first glance.

Let me cite the present situation regarding the striped bass along the Atlantic Coast. The problem is not the same on the Pacific Coast since the major part of the striped bass' range in the west falls within the borders of California—a single state with a single state's conservation problems. On the Atlantic, the laws concerning the taking of striped bass vary within each state's borders. This species is the major sport fish of the East Coast and also is a major commercial fish.

Just after the war, research on the species was practically at a standstill. Much of the material on the fish which had been gathered by scientists over the years was still in manuscript form gathering dust on an obscure shelf. Sportsmen sparked a drive to get this material off the shelf, to develop more research programs, and to find out what could be found out about the fish.

Today almost every Atlantic Coast state has some sort of program of study in progress concerning the fish. To avoid duplication of study, the various programs are being coordinated by the federal government through the Fish and Wildlife Service. Private agencies, agencies supported primarily by sportsmen, and agencies supported primarily by commercial fishing interests are all working toward a common goal. Undoubtedly it will be many years before all the facts are at hand, yet even now the laws in different states are becoming more uniform. The final results may not bring better fishing for everyone. They will bring a better utilization of this natural resource and, with this better utilization, will come a better understanding among the groups interested in the fishery.

To achieve similar results on other species of interest both to sportsmen and commercial fishermen, similar techniques can be used. I was in on the ground floor when the striped bass problem came up. The technique used was simplicity itself. Instead of having the fanatics of each camp yelling at each other, the more sensible members of each camp sat down around a table and talked. It took a good deal of talking, I will admit, but the results are very gratifying. The radicals of all groups are still screaming at each other, but they cannot undo what has been done and, for the most part, their screams do not fall on willing ears.

Strict restrictions may be necessary for the management of a particular fishery. As a sport fisherman, I feel that such restrictions on a species valuable to both the angler and the commercial man should not handicap the latter unless the fishery is of more value to the area as a sport fish than as a market fish. When it can be proved that one particular species contributes more to the economy as a sport fish than it does as a market fish, then, and only then, should stringent restrictions be put upon the commercial fisherman.

There are few species that come under this classification on the marine scene today. With proper management which, let me emphasize again, depends upon research, this number will remain small. Without proper management, it is easy to see the restrictions will become greater as the vast horde of sportsmen becomes greater. Legislators listen to the majority voice—and anglers as a group are one of the most vociferous in the world.

Marine research is in its infancy. For every penny spent by state and federal governments upon it during the past five years, a dollar has been spent on agriculture. Within the next five years, the picture will change as the world turns to the sea for its food supplies. Sportsmen are also turning to the sea for relaxation. They are beginning to realize that they also are a part of the fishing industry.

Management can succeed only if those involved are willing to support its requirements. Until the operator of a string of packing plants and the man who hires a small rowboat to catch three or four fish for his own pleasure can resolve their differences, ideal conditions will not prevail. Neither person may be wholly satisfied with the final results of management, but if they agree that the results are the best possible under the circumstances, no one will complain.

As scientists learn more and more about the oceans of the World and what lives in them, effective and sensible management will result. It is time for both sport and commercial groups to join forces politically, financially and—most important of all—personally to speed this day. I grant that the sportsmen will have to yield on certain fronts just as the commercial interests will have to yield on others. By yielding, both groups will gain tremendously. If they do not agree now when many commercial fishermen are scraping the bottom of the barrel and when the sport fishing army is growing at an alarming pace, the future is indeed gloomy.

I am happy to say that the agreements are becoming more common rather than less. As one small voice among many loud ones, I will continue to plead for cooperation to achieve sound management wherever and whenever I can. I urge all of you, no matter how unfortunate your experiences with one group or the other may have been in the past, to do the same.

The Commercial Fisherman's View

# Effective Management of Marine Fisheries—When Is It Necessary and How May It Best Be Accomplished

By John J. Real,
Fishermen's Cooperative
Association of San Pedro

It is my plan to discuss, in a general manner, the subject of fishery management insofar as it relates to what may be called the "domestic" ocean fisheries. This is a faulty term and is not used in the biological sense but rather in the political aspect. I do not mean that I will cover only management principles which apply to stocks of fish which never venture away from our shores. These, in the aggregate, are our least important ocean fisheries. Instead, this discussion will concern itself with the fisheries which touch our shores and in which our domestic fishermen are interested. Primarily attention will be directed to attempts to control these fisheries by the legislative acts of our several coastal states. The commercial fisherman's point of view on such controls, whether they be already in existence or merely proposed, will be set forth.

The matter of management of what may be termed "international" or high seas fisheries will not be discussed except insofar as that subject may bear upon the attempts to control these fisheries through the unilateral act of any one of our several states. However, in passing, I do wish to emphasize the present and future importance of the problems surrounding management of high seas fisheries. That subject has been forced into a marriage with the problem of territorial waters and the threat of the present trends in that field to the U. S. fishing and maritime industries is one which should receive the constant and considerate attention of every U. S. citizen. The seeds of violent international disturbances lie in it.

There will not be discussed here in any detail, the merits or demerits of any one of the many management devices applied in plans for control of the fisheries. Rather, this discussion will concern itself only with the matter of the commercial fisherman's point of view on attempts to restrict his fishing effort by legislative, or administrative management of what we have called the "domestic" fisheries.

It would be an "ostrich-like" approach to avoid discussing this subject in terms of the controversy which surrounds it. For some reason this controversy pits against each other in violent argument two men possessing like virtues. There are no greater paragons of calmness and patience than the commercial fisherman in search at sea of the object of his livelihood or the angler in pursuit of his recreation. There are continuously erupting disputes on the subject and it is best viewed in a manner which would frankly spotlight these arguments, their basis, and their possible solution. In this approach it becomes necessary to designate the parties to the dispute. In doing so a calculated risk is taken that there may be included within the respective groups many who do not share the mass thinking which that group publicly expresses. This, I trust, will be constantly borne in mind.

On one side of the debate stands the commercial fisherman and on the other end stands the sport fisherman. At times allied with the latter is the "political conservationist" who must be "all things to all men" and who pays lip service to the economic importance of the commercial fishing industry but leans in the direction of the weight of numbers rather than the logic of the case. Fortunately the latter are few in number but none the less dangerous because of the high positions they occupy in the fisheries field.

One notion which has become popular through its continued reiteration by the advocates of fishery control must be quickly, categorically, and summarily dispelled. This is the idea that the commercial fisherman will never submit to an invasion of his "right" to fish, and that he will never accede to the necessity for controlling his activities. Such is absolutely not the case.

Individually he may view all restrictive legislation in much the same vein as the ordinary citizen views taxation or other restraints on his liberty, or as the patient considers medicine; he doesn't like it but he does not quarrel with its necessity in the proper cases. "No man loveth his fetters, be they made of gold." Collectively, however, he will not only accept but will seek curbs on himself where he is convinced that such are necessary to the continued wellbeing of the fishery. As a good citizen he regards the legitimate protection of a natural resource as important to the present and future welfare of the nation. As a thoroughly practical businessman he regards it as vital to maintain the fishery resource at as constant a level as can be achieved by any act of man. This does not seem to be recognized by the proponents of unnecessary restriction. They do not seem to realize that the initial cost and the normal useful life of a processing plant or fishing vessel is far greater than that of a rod and reel. They do not consider that those persons making such investments are fully conscious of the necessity for maintaining a constant source of supply of raw fish. To fail to recognize this is to attribute a degree of financial stupidity to the commercial fishing industry not warranted by its business success. Actually it is the commercial fisherman who gains the most from sound management and loses the least if it is not there. The first statement is made on the obvious, the latter is based on the accepted proposition that commercial fishing will never totally deplete a stock of fish. If the stock becomes so low as to become unprofitable to fish the commercial fisherman must leave it. There will still be fish in the ocean and usually in sufficient quantity to sustain a sport fishing activity. It is therefore not sound management of a fishery which the fisherman opposes but rash, ill-considered plans of limitation. The commercial fisherman rightfully demands, before an invasion of his privilege occurs, that proof of the necessity of control and its consequent benefits to all be established beyond a reasonable doubt or at least by a preponderance of the evidence. What is usually interpreted as short sightedness, indifference or greed on the part of commercial fishermen when controls are proposed is actually nothing more than the exercise of legitimate caution in an analysis of the need for, or the effects of, proposed restrictive measures. This is because most of the usually proposed restrictive devices are alleged to be nothing more than mere experiments. The commercial fisherman can little risk an exploratory operation that might wind up as an autopsy.

Since this discourse is directed to the controversial aspects of the need for fishery management, there is little point in discussing at any length the various devices by which such controls are effected. It should be mentioned, however, that no device—whether it be bag limit, closed season, limitation as to use, size limit, gear restriction, closed area or any of the others generally followed—fit every situation even where control is found to be necessary. The choice must follow the objective and will vary with the degree of limitation required and with the type of fishery concerned. One general principle alone need be borne in mind here. That device which occasions the least economic detriment, while substantially accomplishing the same objective, should be used. In such a situation the fisherman, because of his knowledge of his own business should be given prime consideration in the selection of the device.

Attention is now directed to some of the basic reasons for the existence

of this controversy and the commercial fisherman's justification for his cautious approach to proposed plans of limitation. Where I speak in these instances of restrictive management and the proponents thereof, I am speaking only of the cases where the need for management is not clearly established but is nevertheless being sought by these advocates.

This dispute generally arises upon the "disappearance" or decline of a commercial fishery. The logic of the apologist for control runs something like this: The fish were here before; the commercial fisherman fished them; they are not here now; therefore the commercial fisherman is responsible for their decline or disappearance. Even some otherwise honest ichthyologists have from time to time slipped into this sloppy reasoning. Nevertheless substantially all scientists interested in this field support the proposition that the lack of availability of fish to a fisherman does not necessarily represent a lack of abundance of fish in the ocean, nor does a diminution of abundance itself necessarily represent a danger to the continued welfare of the fishery. This point will not be discussed further here but there is commended to your reading a treatise on this and related subjects designedly written in layman's language by Dr. Clarence P. Idyll. The work is entitled "A Concept of Conservation in Marine Fisheries and its Implications in Fishery Management."

This controversy is not confined to the academic. It actually finds expression in various forms of legislative action. If in any group of laws can be found the seeds of unnecessary discrimination, needless restriction on legitimate activity, and many ill-conceived plans of control of a natural resource, they are to be found in the fish and game codes of most of our coastal states. The presence of such legislation now on the statute books is explainable only by an analysis of the political aspects of this controversy.

The proponents of restriction have the upper hand politically. They are far more numerous than the commercial fishermen. The fact that they are more widespread geographically gives them better access to more legislative ears. This is a realistic political fact—not an indictment of our legislative system. Fortunately, most legislators will arrive at honest conclusions if given the facts and the time and opportunity to study them. But unfortunately legislators are busy men and the fisheries is an extremely complex subject. The word "conservation" is a magically popular one. No one is against it and everyone is for it. It is always the lead banner of the apostles of restriction. It is no wonder, therefore, that even intelligent legislators are sometimes carried away by its magic. This situation is made more difficult by the existence of public conflict among scientists themselves on specific subjects of fishery legislation. Worse still is the reluctance of some, for purely political reasons, to express a scientific opinion on a given subject in dispute. This places the commercial fisherman in his fight against illegitimate restriction in a seriously detrimental position. He usually loses or is forced to compromise to "save his skin". It is for the most part this "compromise legislation" which subjects many sections of our fish and game codes to the criticism that they are conceived in ignorance and dedicated to the proposition that all men must be placated.

This subject can hardly be touched upon further without some discussion of the term "conservation" and its implications. It is around that concept that most errors are made and it is in its name that most injustices are committed. On this topic I again commend to your reading Dr. Idyll's work cited before. I also refer you to the first few pages of a paper written by Dr. Milner B. Schaefer entitled "Fisheries Dynamics and the Concept of Maximum Equilibrium Catch". Dr. Idyll furnishes the key to the problem when he says:

". . . there are too many individuals and groups whose activities are directed toward preserving fish resources for their exclusive use, without regard to the rights of others. Others are sincere in their unselfish efforts to guard our natural resources, but are led into useless or harmful activities by the lack of a clear aim, and ignorance of certain principles. Among professionals, including scientists, there are too many to whom conservation means, largely, restrictive laws."

The oceans of the world were not designed as vast acquaria for the visual pleasure of mankind in their flora and fauna. Nor were they created as playgrounds or international parks for man's recreation alone. These two uses have their proper place but are neither primary nor exclusive. The fish in the oceans were created to be taken and utilized by man. Since it cannot be left to each man to catch his own fish, commercial fishing is needed to assure that the fisheries will attain their highest degree of utility. It is paramount that the concept of conservation of the ocean fisheries be viewed in that light. Conservation is usually expressed in terms of restraint and the word itself connotes a "saving." The obvious corollary questions of "for whom" or "for what" are seldom answered in the passionate pleas for preservation by restriction. Since the primary purpose of the creation of the major ocean fisheries is to feed the world, the answer to these questions must of necessity be "for the world, and for the purpose of satisfying the world's food requirements." This then leads to a definition of conservation which is better interpreted in terms of a concept rather than as a word alone. It finds expression in the statement that fishery conservation means the necessity for the maintenance of a sustained maximum yield. And here again reason abdicates and passion prevails. A necessary element of this entire concept of a maximum yield is that it can be just as wasteful to harvest too little as it is to take too much. Unfortunately this idea does not have the widespread popularity or the considerate thought of the public and, in many cases, of the people charged with the enactment and administration of statutes, which for lack of a better term, we call "conservation laws". Dr. W. M. Chapman summed up this situation as follows in a report made to a Congressional Committee while he was in the Department of State:

"Each population of fish has a certain crop which can be safely taken from it each year without harming the productive potential of the population. If a larger crop is taken there is wastage because that will cut down the crop that can be taken next year and in following years. What is not generally understood, however, is that if a smaller crop than this safe maximum is taken there is also wastage. The fish simply die unused. It is of no interest to mankind at all that the ocean is full of fish. It is only these fish that are available to eat or otherwise use that are of practical consequence."

Any experimental restriction would have to be enforced for years before its validity, or lack thereof, was manifest. It would be little solace to the world for its loss, and little recompense to the fisherman for the economic hardship suffered by him, to be told at the end of this experimental period, "We're sorry. We made a mistake. More fish could have been taken." Unless possessed of some not now apparent Phoenix-like quality, the industry might never recoup and the interim blow to true conservation would indeed be severe.

As an aside, I may state that I recently heard conservation defined as "the triumph of common sense over ignorance and greed." While this is not, nor was it intended to be, more than a poetic definition of the concept, it is mentioned for the purpose of commenting that while taking too much may be greed, taking too little may be ignorance.

One outstanding reason why a fisherman is cautious about embracing any given restrictive measure lies in the fact that in most instances of presently uncontrolled fisheries there exists public scientific disagreement on the causes for a fishery's decline. If the decline results from causes other than overfishing, the reason for restricting the fishing effort disappears. Such scientific disagreements

are not limited to this phase of the subject alone. While there may be no general acceptance of the principle, it is interesting to comment that in 1953 Dr. A. G. Huntsman said, "There seems to be no good basis for restricting fishing in order to increase the long term yield." In an area where clear scientific opinion becomes so vital and where substantial disagreements prevail, it is dangerous to conduct experiments that must obviously have serious economic consequences.

Tampering with an industry and the livelihood of the people in it is a deadly serious business. It can only be justified where a clear and concrete necessity for it is first found. Adequate scientific research of the fishery sought to be managed must be an indispensable prerequisite. In this regard it should be mentioned that it is the commercial fishing industry which has sought most of the fishery research programs now underway. In some cases it is the industry which pays for the research directly through taxes on itself. Such is the case of the cooperative research program on sardines and other species being carried on in California. Unfortunately in the last decade research work on particular stocks of fish have commenced after the fish had "disappeared." This pattern, however, is changing. The cooperative research program in California, geared principally to the study of the sardines which had already declined when the program was commenced, is now also studying other stocks of fish where no so called "danger signs" are apparent. On the international scene the Inter-American Tropical Tuna Commission is doing likewise with tuna. Other similar state, federal and international programs are underway or contemplated.

The importance of adequate ocean fishery research cannot be overemphasized. If it is timely begun and properly carried out it should reveal the need or lack of need of restricting the fishing effort and should dispel most of the scientific disagreements. In addition, such research could provide the vehicle for the discovery of new or latent fish stocks which can be utilized commercially. From the fisherman's standpoint, these new fisheries would help to replace those in which he might be required to practice restraint as a result of legitimate restrictions.

The timeliness of research is important. One of the best ways to determine the causes for a decline in a fishery is to be possessed with an abundance of information regarding the fishery when it was at its peak. The comparison of conditions obtained from early research with the situations present at the time of decline will reveal much that may not otherwise be discovered if research is started too late.

Intimately linked with the matter of research is another factor which appears in many ill-advised management programs of a pelagic fishery. This is the proposal to close such a fishery completely to all but sport fishing activity. Aside from the discriminatory features of this, an important element touching on research develops here. In order to evaluate the condition of such a fishery properly and to note changes in such a condition much of the necessary information must be acquired from a continuing commercial operation. Researchers would need as many research vessels as there are commercial vessels operating to know and properly evaluate the relative availability and

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abundance of pelagic fisheries. The best, and probably the only way, to determine how much fish is in the ocean and where it is, is to permit commercial fishermen to seek it out. A complete closure of the fishery would prevent this and there are very few, if any, cases where fishing cannot be permitted to be continued even if it is necessary to limit the take.

A further reason for the exercise of extreme caution before conceding to fishery management in a questionable case lies in the fact that a restriction on a domestic fisherman could create strong and permanent foreign competition. A case in point is the California sardine fishery. The California sardine is equally available to the California fisherman and to the Mexican fisherman operating out of Lower California. The fish found in both areas belong to the same population. Assume that California should find it necessary to restrict the fishing effort on sardines and adopts measures limiting the activities of California sardine fishermen. This would most assuredly give an impetus to the sardine industry in Lower California which would result in its gaining such a competitive foothold that it could never be dislodged. At the same time California's management program would be rendered ineffective because the Mexican fisherman would be unrestricted and would draw upon the identical fish population which was sought to be protected. The California end of the pipe would be narrowed and to the Mexican end would be added a funnel. Management of such a fishery would therefore obviously require the action of both Mexico and California (as well as Oregon and Washington where the same sardines also touch) before such control could be effective. Unilateral control by California would be sheer folly.

Not the least among the additional reasons for caution and careful scrutiny of proposed restrictions is the tremendous economic impact that limitations can have on the industry. As a result of restrictions the fisherman will catch less fish and unless he is able to compensate for this by an increased price for his product, he soon must leave the fishery. But today where the choice of foods is still ample and where the consumer is largely a price conscious buyer, the possibility of price increases on fish is limited.

The price problem is further aggravated for the fisherman, in some instances, because despite the fact that he may be catching less fish, either because of natural declines in the fishery or man made restrictions, he nevertheless cannot raise his price but must, in fact, lower it because foreign competition must be met on that particular fishery product.

Still further reason for a fisherman's caution is the fact that although he will generally accede to scientists' opinions and recommendations when there is no disagreement among them, he feels that because of his continuous experience he knows more regarding the forces of the ocean than the usual layman who is a plaintiff for restriction. When scientists disagree or remain silent the fisherman rightfully considers that his opinion on the possible causes of fishery decline should be given more consideration than those of the apologists for control. He is not without merit in this contention.

For many years the California pilchard fisherman explained the "disappearance" of the sardine in terms of the shifting of currents. His statements were scoffed at by the apostles of restriction. However, the latest published report of the government agencies investigating the causes for the "disappearance" of the California sardine devoted considerable length to the effect of currents on the strange antics of this species. Dr. Roger Revelle stated in this regard in 1954 that "one of the principal factors bringing about recent poor year classes of California sardines may be changes in the ocean currents off the

California Coast." The fisherman has been vindicated.

Another instance of this has been the long standing opinion in the ranks of these same sardine fishermen that ocean pollution has been a major contributing cause to the sardine decline. On February 3, 1955, Dr. Carl Hubbs of the Scripps Institution of Oceanography told the San Diego Regional Pollution Board that fish life has been reduced alarmingly in San Diego Bay because of pollution. He also advised them that pollution has contributed to impairment of offshore fishing by reducing feeding areas within the bay. Of course, it is realized that there has been fairly general agreement that pollution has affected fish life but there has been little accord with the fisherman that it is a major cause of fishery decline. While Dr. Hubb's remarks were not directed necessarily toward the sardine decline, he is cited to show the further tendency toward eventual vindication of the fisherman's theory.

The attempt to this point has been to show why a fisherman is rightfully cautious in his scrutiny of proposed fishery management programs. His caution has been misconstrued or unheeded. Herein lies the great controversy. Its fruits have resulted in legislation which is bad. Since for the most part it has been "compromise legislation," the fishing industry has been able to survive under it. But the threat that the tide cannot be stemmed is ever present and it could erupt into legislation, which even though it be of only short duration before the mistake is discovered, could permanently ruin certain phases of the industry. It is therefore appropriate to suggest some possible approaches to the solution of the problem.

To industry a series of possibilities are suggested. First, industry should press for and support timely and adequate research of the ocean fishery. It should insist on having a say in the research pattern to be followed.

Second, it is suggested to industry that one of the foremost reasons for the difficulties it has had in resisting rash restrictive legislation is that for the most part the proponents, the public, and even large segments of the industry itself are uninformed as to the proper objectives of management, when it is needed, and when it should be justifiably opposed. This throws on industry the burden of keeping itself informed and through aggressive public relations informing others interested. This sounds as if it should be self-evident but it is a constant source of distress to witness the commercial fishing industry, a subject of constant attack, capably conducting intelligent advertising programs of its products but none of itself.

Third, the matter of the high principle involved in fishery legislation should be more keenly felt by the industry. In this regard it must not attempt to isolate its problems to separate interests within the industry, within the state, or within the nation. A needless restriction imposed upon a fisherman is not the fisherman's problem alone. It paves the way for other and further needless restriction. It creates an abundance of dangerous precedents which are later pointed to justify such new and equally harmful restrictions. The processor usurps no authority when he feels it necessary to take the lead in the defeat of such legislation even though it may not be designed primarily against him nor have an immediate effect on his interests.

In this same regard it might be added that industry should not rest upon a resolve to vigorously oppose future unnecessary restriction but should unite in its efforts to repeal hurtful and unnecessary restrictions now on our statute books.

Lastly, while it may be extremely difficult to do so, industry should constantly strive in the direction of lowering the cost of the production of raw fish. Doing this will provide some necessary economic relief when the industry must limit itself in the interests of legitimate fishery conservation. If the fisherman must catch less fish, he will obviously not feel it so badly if his cost of catching has been reduced.

The foregoing possibilities of solution of an obvious problem are for industry. It is not intended as an exclusive list. For government there is a similar although somewhat overlapping list.

It is, and should be, one of government's prime functions to preserve not only the fisheries for the legitimate and continued use of all of the people but also to do so with an eye to preserving the fishing industry as an important (and possibly in the future indispensable) source of fulfillment of the world's food requirements. Those officials given the responsibility of the fisheries are charged with a solemn duty to prevent, insofar as they are able to do so, any injustice on the part of opposing forces. Alexander Hamilton put it well. "It is of great importance in a republic not only to guard against the oppression of its rulers but to guard one part of society against the injustice of the other part." Some state officials are known to have lost sight of this.

In pursuit of this, government should commence its research programs on fishery stocks long before the so-called "danger signs" appear. It should, in this respect, also study stocks of fish which are known or thought to be plentiful but which are not presently being utilized. These fish stocks may serve as adequate substitutes for fishermen partially displaced by necessary restriction. A knowledge of the maximum safe productivity should be known in advance insofar as possible. The economics of the industry can then be shaped to rely upon only a given amount of fish from that stock.

Second, government itself should engage in an aggressive information campaign. We appreciate that reams of literature are available on the subject of fishery conservation and management but for the most part they are scientific discourses, little understood by people in fisheries, and not even read by persons who may only occasionally be called upon to decide matters of vital interest to the fishing industry. These publications must be written in clear and simple language. It may be difficult for scientists to divest themselves of the language with which they are most familiar through daily association. I respectfully submit however, that, in most cases, this language defies the comprehension of this speaker and I suspect that there are many others in the same position. It is incumbent therefore, while such information originates with scientists, that it be set forth in plain and simple language and that persons skilled in doing so be employed to accomplish this end. The case of the commercial fisherman is logical and honest. He does not fear a continuous and thorough public airing of the problem for he has no fear of the truth. As Milton said, "Let truth and falsehood grapple. Who ever knew truth put to the worse in a free and open encounter."

Third, government can and should aggressively pursue a program designed to conciliate the opposing forces in this continuing debate. It should not wait until the battle lines are drawn and its help solicited. It is usually too late then. History dictates that this will be a constantly recurring war unless the proper basis for a permanent and honest peace can be established. To help achieve this peace is a proper function of government.

As in the case of industry, this list of possibilities is not exclusive. Before concluding this phase of the subject, it should be mentioned that "government" has been spoken of here in general terms. Matters with respect to the elimination of this great controversy should be of joint concern to our federal and state governments and not be usurped as the prerogative of one. I am fully aware of the political science conflicts and the jealous regard for states' rights involved. It is strongly urged that this not become a fetish. The commercial fisherman does not advocate federal regulation of purely state matters and in that regard would not tolerate federal regulatory authority in the fisheries of a state. He does urge federal participation and expression in the field of fishery research and in the dissemination of information to the public on matters of concern to the fishery. The fact that such information may result in airing differences of scien-

tific opinion should not deter its issuance.

Before concluding the subject of fishery management one other phase should be mentioned. Management of a fishery is usually viewed in a negative sense; that is, it is viewed, as has been stated, as a restriction on the fishing effort in the expectation that such a restriction will yield a greater long-range return. Actually management could just as well mean an effort to expand the fisheries by affirmative methods. It is not outside the realm of possibility that expansion of the ocean fisheries can be obtained by transplanting of fish from one area to another. While this is presently economically unfeasible, our generation may still see it.

Your attention is called to a very interesting experiment in this regard which is taking place in the Gulf of Nicoya where transplanting of anchovetas from Panama is being done under the auspices of the Inter-American Tropical Tuna Commission. While it is far too early to say that this is a practical way in which to replenish a declining fishery, the results thus far are encouraging.

Also in this respect your attention is called to a speech made at this Convention last year by Dr. Roger Revelle. He stated therein that the fertility of the green pastures of the sea could be increased by man by the addition of necessary nutrient substances to the ocean. As he said, "We might by a relatively small expenditure, be able to add these substances to the water and thereby to increase greatly the yield of the California fisheries." These are phases of affirmative management which invite considerable further study.

# MEETING OF N.C.A. DIRECTORS

## The Washington Scene

**By H. Thomas Austern,**
**Chief Counsel,**
**National Canners Association**

It has become increasingly difficult, in a brief talk in the middle of an absorbing trade convention, to give you a balanced view of the Washington scene.

This difficulty derives from a variety of reasons. The sheer complexity of our federal government has come to mirror the intricacies of our economy. The vast scope—in people, in range, and in dollars—of federal activity is hardly surprising for a nation of over 165,000,000, with political and economic commitments girdling the globe.

Even more, the Washington scene is always kaleidoscopic. At any time, and certainly over a calendar year, there are shifting emphases from—domestic politics to foreign affairs—from the major implications of a threatened war to the personal feuds and foibles that have made some Washington episodes so magnetically attractive to television audiences—from arguments about agriculture to squabbles about public health—from detecting subversion to Dixon-Yates.

Possibly the greatest impediment to presenting any balanced picture is the seemingly inescapable tendency of everyone to measure public affairs against the horizons of his own experience alone—and often unconsciously to evaluate their relative importance merely in terms of his own particular interests.

This was recently illustrated by the New York restaurant keeper who posted a large sign that read:

"In case of atomic attack—keep perfectly calm; pay your check; and then run like hell to a shelter."

### Foreign Affairs

Nevertheless, one must select and mention those things which are obviously important. Inescapably, the first of these is foreign affairs.

Never before have alert adults had comparable compulsion to learn new geography. Burned into our memories are such places as Tobruk and Truk, Bengazi and Bastogne, Okinawa and Iwo Jima. But the unhappy and unwanted lesson in geography still continues. Headlines of the past weeks carry such unlikely names as the Tachens, the Pescadores, Amoy and Matsu. No true account of what is going on in Washington can neglect stressing that on any quantitative scale, Formosa and the islands near it are burning topics of interest.

Discussions of the cold war engender constant heat. Sometimes indeed one wonders whether language has changed its meaning. We talk about the failure of a "cease-fire" arrangement, while at the same time congratulating ourselves that not an American shot has yet been fired.

To maintain perspective amidst these pressures is not easy, and incredibly difficult for those who have major responsibility for our foreign affairs. In his first message to Congress last month, President Eisenhower reminded us that by and large the world is still today at peace—even though it may be an insecure peace. As he then said, one can find hope "in the simple fact that for an appreciable time there has been no active major battlefield on earth."

But never forget that this uncertainty whether peace can be maintained, touches and colors everything else. It controls our defense spending—which directly dictates the size of the federal budget. It often inflames political discussion, and, more fortunately, makes many of our national issues essentially bipartisan. Indeed, in anything reported today, this brooding omnipresence of a possibly imminent armed conflict must remain the inarticulate major premise in any plan, project, prediction, or hope.

Necessarily tied to this issue of peace or war is the recent shake-up in the Russian Government—with all of the accompanying analyses and surmises as to who may be the real powers in Moscow—and also the recent overthrow of the French Government and its possible effect on European affairs.

I have neither the time nor the competence to offer you an extensive discussion of our foreign policy. You have your choice of experts in every newspaper. The problems and responsibilities of the United States as a world power will not only continue to occupy your own time and attention. They are also likely to absorb a good part of Congressional time and energy during the coming year. Once again, this is hardly surprising, when American commitments range from Formosa to the South Pole and from West Berlin to Korea. As to Formosa, whatever may be the hazards, no one can deny that Congress is solidly behind the President's policy.

Only slightly less unanimity exists on the President's request for a three-year extension of the authority to lower tariffs by reciprocal trade agreements. This was the first bill in the 84th Congress. H.R. 1 will give the President the power to cut tariffs by 5 percent per year for three years. Support for it cuts across party lines. Even though the power may be circumscribed by added amendments, the bill is almost certain to be passed.

This reciprocal trade program emphasized trade and not aid. Next June may very well see the end of the Foreign Operations Administration, the agency now charged with administering the residue of the Marshall Plan. Any remaining economic aid to Europe, or to Latin America, will be handled by the State Department. Even though ambitious programs have been drafted for expanded economic assistance in Asia, a good number of Congressmen do not want to enlarge our financial commitments in that area at the present time.

Obviously these world-wide military and economic responsibilities directly and drastically affect the federal budget. For the fiscal year 1956—beginning on July 1st of this year—the President has asked Congress to

appropriate $62.4 billion. This is $3.1 billion less than last year's budget, but is still an astronomical amount of money even for the wealthiest nation.

### National Security

Out of this $62 billion, almost two-thirds, or $40 billion are ear-marked for national security needs. A commitment of this magnitude for defense and foreign aid is hardly novel. Possibly more significant is that there continues to be no early prospect of escape from this tremendous outlay. The budget figures for the Army, Navy and Air Force for the fiscal year beginning next July are virtually unchanged from those for the past year. Once again the Air Force is scheduled to get almost as much money as the Army and Navy together. Once more there are respected voices that oppose the scheduled reduction in ground forces. It is a fair guess, however, that in this defense area President Eisenhower's recommendations will prevail.

The federal government's fixed charges, such as interest on the public debt, veterans' payments, and aid to the states, will take up an additional $14.8 billion of the budget. Consequently, the national security requirements and these fixed charges comprise about 90 percent of the total expenditures.

This leaves little room elsewhere for cutting Federal expenditures. Congress keeps trying to do so. The Federal budget is still as big as a telephone book—indeed, what is called a "Summary" runs to 322 pages. Yet in the last analysis there is small scope for Congress to eliminate or to trim the ordinary costs of running the federal government.

Indeed, there are some who think that on many essential operations the reductions already made have impaired minimum efficiency. Some of these areas, such as food and drug enforcement and the collection of sound statistics, are of direct concern to the canning industry. Yet since needs continue to out-pace means—and everyone has his own pet project and particular economy—there appears to be very little room for specific increases or for further overall economy.

### Taxes

Of course, one can spend more if his income can be increased. This brings us as always to the subject of taxes.

Federal revenues for the next fiscal year are estimated at $60 billion. To get this much money will mean—and the President has asked—that corporate taxes, individual income taxes, and excise taxes continue at the 1954 levels. As you know, both the corporation tax rate and many of the excise taxes are presently scheduled to be reduced this April, and Congress has been asked to extend them at the present rates.

The corporate tax will undoubtedly be continued at the present 52 percent level. It is probable that the excises on liquor, cigarettes, automobiles and gasoline will also be maintained at existing levels, even though political pressure for reduction will continue to be intense. On this basis, tax legislation in 1955 may well be limited to technical changes of very narrow scope and little substantial importance—again barring war.

President Eisenhower has repeatedly suggested that reductions in individual income taxes might be made in 1956. Many Democrats would like immediately to champion that kind of tax reduction. You can expect to hear a great deal of talk about it. It may well be that some Congressmen will attempt—possibly as a rider to a bill extending corporate and excise taxes—now to reduce individual income taxes for next year. So long as the foreign situation remains tense, those wanting to do so will probably have a hard road to travel.

In government as well as in business, there is no escape from simple arithmetic. Expenditures of $62.4 billion against an estimated income of $60 billions means for the next fiscal year a deficit of $2.4 billion.

Of course, this $2.4 billion deficit is only about half as much as the probable actual deficit of $4.5 billion for the present fiscal year. But this comforting downward trend will not enable Congress to avoid another raising of the ceiling on the public debt. This is supposed to revert to $275 billion on June 30, 1955; but if nothing else is certain, it is clear that the ceiling on the public debt will have to be raised on some permanent basis.

In addition, the size of the federal deficit and the realistic absence of any immediate prospect of reducing the public debt, has led to the interest in methods of handling governmental projects outside of the federal budget and the debt limit. As an illustration, it has been proposed to finance a major highway system by bonds of a new Federal Highway Corporation. These bonds will be sold to the public and not be within the debt limit.

The size and permanence of the federal debt has also led to attempts to refinance it on a longer term basis. During the last decade federal borrowing was largely through short-term obligations. Many of these are currently maturing. How they are refinanced has a very considerable effect upon monetary and credit policies. From time to time the Treasury will attempt to put these obligations on a longer term basis, even at the price of higher interest rates, and refinancing will serve as an important monetary control.

If you examine the schedules in the federal budget, you will find that both the tables of receipts and expenditures are labeled "Estimated." This is simple realism. What will be spent depends on what Congress first appropriates and the Administration in fact spends. What will be collected depends upon the state of the economy. In other words, with the bulk of federal tax receipts deriving from corporate and individual income taxes, the volume of personal income and corporate profits will determine what can be collected.

### Economic Activity

Last year I reported the consensus that a slight downturn in the nation's economy appeared likely for 1954. The prediction was for an increase in unemployment of about 1.5 million, and a fall in the gross national product of about 5 percent. In short, the outlook then was that 1954 would be a period of moderate recession from the peak of 1953.

This is pretty much what happened—but the significant thing is how it happened.

No longer, perhaps, do the ups and downs in one line of business have immediate and direct impact upon all other commercial activity. No longer is the American economy so sensitive that any one or two adverse factors can alone trigger a depression.

This is illustrated by what happened in 1954. As you will recall, there was a substantial decrease in government defense orders and a fairly sharp liquidation of business inventories in the early part of the year. But countervailing effect came from the tax reductions for both corporations and individuals, and from the easy money policies permitted by the Federal Reserve Board in mid-1954. Added to this, and also important in counteracting any decline, was the continuing construction boom which broke records for the eighth straight year with an all-time high of over 37 billion in new construction.

On the basis of these recent developments, many of our prominent economists suggest that the severe fluctuations which have characterized our entire business economy may be a thing of the past. Recently, Professor Slichter pointed out in the *Harvard Business Review* that the boom-bust cycle is now being broken up into independent, narrowed and lesser business cycles which may often offset one another.

If the stock market is any reliable index of what has happened, or is likely to happen in 1955, you can readily examine the reports of volume of sales and price levels since November, 1954. Those who want something better usually resort to other indicators of business activity and to the opinions of economists.

George Bernard Shaw once said that if all the economists were laid end to end, they would not reach a conclusion. Strangely, however, there

is at the moment general agreement among economists—of divergent political leanings and representing many varied interests—that 1955 will be a slightly better year than 1954, even though it may not be quite up to the all-time peak year of 1953.

In the basic measure these economists employ, this would mean a gross national product — the total value of all goods and services—of about $362 billion for 1955. This can be compared with $356 billion for 1954, and $365 billion for 1953.

The President's Council of Economic Advisers seems to be clearly gratified by the strength shown by the economy in the latter half of 1954, and particularly by the upsurge of business in the last quarter. In their guarded way, they are quite optimistic and propose no significant changes in administration of economic policy for 1955. The commentators almost uniformly characterize the Council's reports and views as reflecting the "middle-of-the-road" philosophy of the Administration.

Whether the picture is as rosy as most of these economists suggest is difficult for the ordinary fellow to determine. There are, as always, a number of dissenters. These gloomy fellows are worried most about the increased unemployment even with greater business activity.

Their fears spring largely from the anticipated increase in the number of those who will be seeking jobs and the possibility that technological advances will not permit them to be absorbed.

About one million new workers are expected to enter the labor market in 1955. Production in almost all enterprises has become increasingly more efficient. This is graphically shown by the fact that even though there were a million fewer people employed in manufacturing industries last November than in November, 1953, the index of industrial production was practically the same for both months. Consequently, even though industrial activity may increase slightly in 1955, many feel that unemployment may be greater by one-half to one million more workers than the 1954 average of about three million unemployed.

Indeed, in some regions of the United States, such as parts of New England and the eastern coal fields, there are now fairly acute unemployment difficulties. If the spring months of 1955 reveal any substantial rise in unemployment, the federal government may have to develop some fairly large programs to stimulate employment.

Some economists insist that the real problem of American business is how fully to utilize this growing labor force. They suggest that a level of business activity that would permit full employment would require a gross national product of about $385 billion—or about $20 to $25 billion more than is optimistically expected for 1955.

As you know, the year 1955 has started very happily. The construction industry continues to boom. With housing starts at an all-time high, builders look for another record year. The interest in new 1955 automobile models—and the production and sales race among the automobile manufacturers—has given a great impetus to business activity, and particularly to steel production. Many people believe, however, that automobile production must inevitably be cut back as the year progresses. If this happens, it will complicate the employment picture and have fairly ramifying effects upon the economy. For this reason

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wage negotiations in the auto industry will be watched by everyone. The major five-year labor contracts terminate this year, and the new negotiations will probably center on the issue of a guaranteed annual wage. In recent weeks the railroad unions have also been talking about a guaranteed annual wage.

In short, those who harbor doubts about what may happen in 1955 center their attention upon the possibility of maintaining business volume and of getting buyers to continue to take their goods.

### Population Growth

One thing is dramatically clear: Our population continues to grow at a record pace. Last year I recounted for you the extraordinary number of new babies being born. But the remarkable thing is the continuing net increase in population. How this goes on around the clock every day is graphically illustrated by an electric chart of the Bureau of Census located in the Department of Commerce in Washington.

Occasionally, I have thought that it might be a good thing to bring that exhibit to our Annual Convention for all those in the food industry to see. On a large board there are five differently colored bulbs which flash intermittently. Every 8 seconds a blue light flashes to denote a birth. Every 21 seconds a purple light records a death. Every 2 minutes the lighting of a green bulb indcates the arrival of an immigrant, and every 24 minutes a red bulb shows the departure of an emigrant.

The net effect of this continuous change in population is shown in two ways. Every 12 seconds a white light flashes to show that there has been a net gain of one in the country's population. As this white light goes on and off, a huge numbering dial, resembling the speedometer of an automobile, presents the cumulative total of the population of the United States at any given moment.

This population scoreboard, of course, is not precisely accurate. It is not based on telegraphic reports of births, deaths, arrivals and departures. But it does show with fair accuracy—and I think most vividly —the constant average increase in the number of our people.

The pace of that increase should be a matter of great interest to the food industry. Between 1950, when we had about 150 and a half million people, and July of 1954, there was a net gain of about 10 and a half million—or 7 percent in about five years. As of February 9, 1955, when I last looked at the population meter, the figure shown was 164,240,000.

Think about that rate of increase! Every month the population grows by an amount equal to all those in Richmond, Virginia. Each year the country's population increases by an amount equal to all of those who live in the State of Maryland. Since California is usually considered a fast-growing area, perhaps it helps to tell you that every four years the country's total population increases by the present population of California.

In 1940 the experts estimated that our population in 1975 would be about 180 million. Today they talk of a 1975 figure of more than 220 million. This constantly expanding population must, of course, find work. By the same token, the increase will provide the people to consume the goods of an ever-increasingly productive economy.

These people will afford the market for more automobiles, more clothing, and, it goes without saying, for additional food.

In 1954 the United States consumed an estimated $64 billion of foodstuffs —or about $1 billion more than in 1953. Retail food sales were close to

$35 billion, and there will probably be some increase during 1955. As one of the prominent executives in the food industry put it, the basic outlook continues to be for a steady, even if not a spectacular, growth in sales of all processed foods.

But the key question for the future may turn out to be this: With better manufacturing techniques, with greater mechanization, perhaps even with fantastic automatic factories, the country can probably produce all of the necessary goods with present labor force, or perhaps with even fewer employees. How, then, can the rest of them be gainfully employed and adequately paid, so as to provide the required consumer market?

Some weeks ago I read a long article on mechanization in the automobile industry. It contained an apocryphal story. The president of a company was showing a labor leader, with whom he had to deal, a long line of untended machines which automatically made automobile bodies. He said to the union leader, "One thing is clear, Joe, you will never be able to get these machines to pay union dues."

"That may well be," replied the union man, "but how in the world are you going to get these machines to buy your cars?"

### Fields for Legislation

But let us turn to more specific matters and somewhat more close-range prospects.

Taken as a whole, the prices of both farm products and processed foods exhibited some weakness in the last few months of 1954. In doing so, food prices were somewhat against the trend. For, while the wholesale prices and consumer prices for all goods remained relatively constant, the wholesale and retail index of prices for farm products and processed foods declined slightly in the last half of 1954.

Recent Department of Agriculture figures indicate that farm prices were off about 5 percent from 1953. This was true even though the prices for some basic crops were higher in 1954 than they were in 1953. These Department estimates suggest that even though farm prices increased slightly in January 1955, there will probably be some slight further decrease in farm income for 1955. The statisticians suggest, however that retail food prices—along with all other products in the cost-of-living index—will remain relatively constant this year.

In these circumstances, it is not surprising that some Congressmen are talking about the need to go back to rigid price supports for farm products. No one would venture to be certain as to how this argument will be eventually resolved, but the flexible support program will undoubtedly be given a longer trial.

But even flexible support prices continue to be a very costly business for the federal government. It now has more than $7 billion invested in surplus farm products, and this figure grows monthly. Indeed, the Commodity Credit Corporation recently estimated that by June 30, 1955, its loans on farm products will be about $2.5 billion for the single fiscal year.

Apart from the ubiquitous farm problem, it is difficult to hazard any guess as to what the 84th Congress will do. Despite its organization by the Democrats as a result of last November, there is good reason to believe that on many basic issues its over-all complexion has not been materially changed.

Perhaps the most important change that Democratic control of Congress and of its committees will bring about is in the field of Congressional investigations. For two years Republican majorities on Senate and House committees have inquired incessantly into the activities of the Truman Administration and the agencies he staffed. The shoe may now be on the other foot. The activities of the departments and agencies over the past two years will now be investigated by the Democrats.

If one removed all party labels, it would be difficult to tell who is investigating whom. Very often administrative conduct criticized by the Republicans will likewise be criticized by the Democrats. When one reads the resolutions and the agenda for these investigations, he is often reminded of the three baseball umpires who were discussing their trade. The first one said, "I calls 'em as I sees 'em." The second added, "I calls 'em as they are." The third umpire was possibly more accurate. He said, "They ain't nothin' until I calls 'em."

The legislative issues with which the 84th Congress is faced are in reality not new. it must continue to deal with international tensions, and thus must face up to the extension of the draft law. It has been asked to consider tax rate extensions, minimum wage legislation, public power controversies, public housing, health reinsurance, and trade regulation.

I have already suggested to you that all corporate and excise taxes will probably be continued—and that only an incurable optimist would believe that individual income tax rates for 1955 will be any lower. Some form of selective service will undoubtedly be provided, even though the present defense effort emphasis is away from ground forces.

It is not unlikely that the Fair Labor Standards Act will be amended to provide a 90-cent minimum wage, and possibly a dollar minimum wage. If the recommendations of Secretary of Labor Mitchell are followed, coverage will be extended to include some 13 million additional workers. I doubt that agricultural labor will be brought in. Inescapably, there will be prolonged arguments about the form and scope of many of the overtime exemptions. Lastly, there is a considerable body of opinion that the Fair Labor Standards Act makes the Walsh-Healey Act unnecessary and confusing. Perhaps this spring will see some efforts in Congress to trade its repeal against minimum wage increases.

If you will forgive me, I do not want to discuss the Dixon-Yates controversy or the intricacies of public housing. On these, as well as on the President's health reinsurance proposals—and his request for statehood for Hawaii but not for Alaska—there will inevitably be prolonged debate.

Equally sensitive politically may be the proposal to increase the salaries of Congressmen and of federal judges. These necessarily will be accompanied by a raise in pay for Post Office employees and other government workers. The chances for these pay increases all along the line appear to be good, and few people quarrel with the economic justification for them, yet incoming mail from constituents about increasing Congressional salaries outnumbers that on any other subject.

Business regulation and the antitrust laws, I venture to suggest, will also engage a lot of the time and energies of the new Congress. The chairmen of both the House and Senate Judiciary committees, Congressman Celler and Senator Kilgore, have already indicated their interest and have announced continued investigations. These will cover the wave of mergers over the last few years, the basing point and freight equalization arguments, retail price maintenance and fair trade laws and the activities of export trade associations. In addition, bills have already been introduced to increase antitrust penalties and to authorize the government to sue for damages for antitrust law violations.

Completely conflicting proposals with respect to the "good faith meeting of competition" also continued to be urged. Here again the issues are clearly drawn and the opposing forces fairly well balanced, and it is not likely that any legislative clarification will result.

In about a month the report of the Attorney General's National Committee to Study the Antitrust Laws is scheduled to appear—and whatever recommendations it will make will undoubtedly lead to heated debate both within and outside of Congress.

### Business Regulation

Finally, the 90 or more administrative agencies, bureaus, and departments in Washington continue to grind out new rules, regulations, complaints and orders. There has been little diminution in volume. Indeed, the statistics show that the Federal Trade

Commission has issued more complaints since the beginning of 1953 than it had in the preceding two years. Despite restricted budgets, some other agencies and departments can match that record.

Many of these administrative activities directly concern the canning industry. The Federal Trade Commission continues its active interest in agricultural processing, as evidenced by the *Florida Citrus Mutual* and *Ohio Tomato Canners* cases. Its unlawful brokerage complaints continue to involve canners, and its investigation of mergers includes many recent ones in the food industry.

Under the Food and Drug Act, 1954 has seen the paradox of added enforcement responsibilities against the impact of smaller budgets. Last year Congress enacted the Miller Act controlling pesticides. While this new statute does not directly control canned foods, the canning industry is vitally interested in the procedures which will govern the establishment of pesticide tolerances on its raw material. The complex problem of how to deal with chemical additives in all foods once again will be considered by Congress.

But the most difficult food and drug problem confronting the industries regulated by the Act, including the canning industry, is enforcement. It has become completely clear that with present appropriations the Food and Drug Administration must concentrate on public health, sanitation, and gross adulteration. It has neither money nor staff to prosecute economic violations, such as the failure to comply with standards or misbranding. Only when this type of violation is part of an adulteration charge can the agency deal with it.

If continued, this limited enforcement may in time pose serious problems for those canners who religiously comply with all of the rules on the books even though these rules cannot as a practical matter be enforced against less scrupulous competitors.

About a month ago Secretary Hobby appointed a committee of citizens to evaluate the adequacy of food and drug enforcement and to survey the operation of the FDA. Essentially, the job of that group will be to make recommendations as to how, with whatever money Congress provides, an effective enforcement program can be carried on. In that issue, the canning industry obviously has an important stake.

In thinking about the Washington scene, and how its multifarious activities affect the canning industry, I have constantly been amazed over the more than 20 years that I have been intimately concerned with it, to observe how each novel and expanded federal activity so soon becomes commonplace.

Perhaps there ought to be no surprise in any of this. In business many activities upon which an enterprise is vitally dependent are often taken for granted. That the railroads will run, that highways will be maintained, that power will be available, that checks and bank drafts will clear through an intricate banking structure, that letters will be received—are not often an annual source of constant worry.

The parallel to government activity is striking. Let me offer two brief examples: Each year the federal government establishes an annual consumption quota for sugar. Needless to say, every canner is concerned in the supply and price of that commodity. Each year the Association in Washington has to follow the procedure for fixing the sugar quota, and necessarily to protect the canning industry's position. Yet this activity, unknown 20 years ago, is now routine. No one deems it worth elaborate mention.

The rules and regulations and shifting interpretations under the Wage and Hour Law, or the Walsh-Healey Act—alike of immediate dollar-and-cents interest to all canners—are constantly being tinkered with. They must be watched, interpreted, and occasionally litigated. We might add the rules and regulations on imported workers. Yet here, too, these activities startle few people, and the necessity for constant concern with them is usually forgotten.

One could readily multiply these examples. The present point of interest is the capacity of each canner to absorb and to surmount their increasing complexity.

Even more gratifying should be the demonstrated resilience of our democratic institutions. For despite this bramble bush of regulations—now accepted and assimilated into the daily responsibility of every business manager—there has been no diminution in efficiency, no real loss of incentive, and no restriction of the opportunity for the competent to prosper and to grow.

Above all, these has been no loss of personal freedom or the right to criticize and to oppose—either as an individual or as a group—or effectively to challenge any proposal that is believed to be unsound or unwarranted.

Perhaps in the Washington scene—when we forget the trees and look at the forest, however vast it has grown—that is what one should be alert to as basically important. In all that is done, or sought to be done, let us hope that these things are never forgotten.

## A Brief Review of N.C.A. Consumer and Trade Activities during 1954

**By George Anderson, Dudley, Anderson & Yutzy**

At the National Canners Association's Annual Convention in 1954, the Board of Directors authorized the initiation of a Consumer and Trade Relations Program, which has as its aim to establish more firmly the prestige of canned foods, both in the home and in the marketplace.

The C.&T.R. program was designed as an "umbrella" program in that it promotes canned foods and the canning industry as a whole, on a broad scale which permits the several other programs involving paid advertising, retail merchandising and specific commodities to operate in their own areas with extra effectiveness.

This program has been designed as an integral part of the N.C.A. operation. All N.C.A. activities are planned with the ultimate goal of bettering the industry's position with its customers, and all C.&T.R. activities are bound up with the other functions of N.C.A. Each project undertaken is examined according to basic criteria which consider its value from the standpoint of use to N.C.A. members, special approaches affording new opportunities to tell the canning industry story, and special audiences which can be reached with a specially tailored message.

This is in every way an interrelated program, with consumer and trade relations operating jointly. In daily activity, one area is closely allied with the other. For purposes of simplifying this activity report, however, the two fields have been treated independently.

### Consumer Relations

*Magazines*—Food and feature editors of all major national magazines in the women's service and general interest fields are constantly kept informed of article ideas and information which is especially applicable to their interests and approach. To date magazine features following the prestige and glamour theme for canned foods have appeared in *Woman's Home Companion*, *McCall's*, *Seventeen*, *Family Circle*, *Parents'*, *Look*, *Life*, *Redbook*, *Glamour*, *Better Living*, and *House Beautiful*.

Women's editors of 21 farm journals were entertained at a conference and dinner in Washington in October. These editors also regularly receive pertinent follow-up information. Material for a special article for one of the national farm publications was collected on a field trip to The B. F. Shriver Co.

A 1,500-word feature article with six illustrations has been distributed

to date to some 50 company and special interest publications.

*Newspapers*—A clipsheet headlined "Canned Foods For Goodness Sake" and containing 18 articles on canned foods and their advantages went to 1,000 newspapers for the purpose of educating food editors about the canning industry, its magnitude and its worth.

Following that came special articles on specific timely subjects, such as the Babcock-Hart award to Dr. Cameron, the "Teen Cook" story, etc. A color photo and copy titled "Canned Foods . . . The Eternal Horn of Plenty" was prepared for use in ROP color-using papers.

A cartoon-illustrated article which discussed canner-grower relations was distributed in mat form to 4,251 farm area newspapers.

Food writers of the national press syndicates are contacted regularly. Especially significant results have come from King Features Syndicate which distributed a series of six canned food features (an entire week of food columns) under Ida Bailey Allen's byline to its 900 newspaper subscribers. General Features carried a series of five canned food articles written by Edith Barber, over a period of two months.

Among Sunday magazine sections, *American Weekly*, distributed by 29 newspapers with nearly 10,000,000 circulation, carried a double-page color spread titled "Entertain Wonderfully with Dinners From Cans;" *Parade*, distributed by 39 newspapers with 6,000,000 circulation, and *Family Weekly*, distributed by 78 hometown newspapers with close to 2,000,000 circulation, have carried canned food prestige features.

Clementine Paddleford, food editor of *This Week* and the *New York Herald Tribune*, was taken on a field trip to Hungerford Packing Co. because of her special interest in collecting background information on the Pennsylvania Dutch country.

*Television*—Four canned foods TV scripts were released via the regular bimonthly service, each to 238 stations with an estimated audience of 16,000,000. In addition, TV special events were prepared and distributed in conjunction with editorial features in the *Woman's Home Companion*, *American Weekly*, and *Seventeen* magazine.

Personal appearances on TV food shows were made by Mary Crum, TV home economist, in New York, St. Louis, Kansas City, Milwaukee, Chicago, Cleveland, Pittsburgh, Rochester, Detroit (2), Davenport, San Francisco, Philadelphia, Portland, Me., Springfield, Hartford, Albany, Buffalo, Knoxville, and Cincinnati.

A seven-minute canned food demonstration in connection with "Teen Cooks Love Canned Foods" was carried by NBC's "Home Show" on 78 stations with an estimated 4,000,000 viewers.

TV materials have also been placed on request from canners and state secretaries to publicize specific projects, such as the canned foods cutting and sampling show in Dayton, Ohio, the Shoprite canned foods promotion in New Jersey, and the *Woman's Home Companion* feature on the California cutting bee.

A series of six scripts was written for the Minnesota canners to use on local stations. This series was later adapted for use by Tri-State canners on WBAL-TV, Baltimore.

*Radio*—Thirteen radio scripts were released under the "Scriptease" heading, each to 65 broadcasters with an audience estimated at 4,000,000.

Thirteen radio scripts were released under the "Kitchen Air" heading, each to 182 broadcasters with an estimated audience of 7,000,000.

Fourteen "Timely Talks" radio scripts were released, each to 187 broadcasters with an estimated audience of 6,000,000.

A recorded interview of the *McCall's* article "How Fresh Is Fresh?" featuring Dr. Frederick Stare and distributed by the magazine was requested by 285 or more stations.

Special radio scripts have been prepared for use in promoting specific events, such as the Dayton canned foods cutting and sampling, the Shoprite promotion in New Jersey, and the *Woman's Home Companion* article on the California cutting bee.

*Special and long-range projects*—The canned foods reference book for editors, titled *The ABC's of Canned Foods*, is in production and will include background information and basic facts about 50 leading canned food products. The book is loose-leaf so that more products can be added and statistics can be brought up to date at proper intervals. Distribution of this book to some 800 editors, broadcasters and allied industry home economists will be completed in the spring.

The canned foods press conference for editors has been postponed until 1956 at which time it is felt it will have more valuable results for the industry. It is planned for Atlantic City during next year's Annual Convention.

The possibility of printing generic canned food labels for editors and telecasters to use has been carefully explored. This project will be coordinated with the work of the N.C.A. Labeling Committee.

A special feature article on how the atomic submarine Nautilus uses canned foods has been explored with the Navy Department. We are waiting for official authorization to go aboard.

A movie script which would utilize footage available from industry members has been written and will be considered as a project for the coming year. As background, 15 movies of the industry have been reviewed. A catalog of these firms has been made for the information of interested trade and consumer groups.

### Trade Relations

*Special activities*—In the area of trade relations much benefit has resulted from contacts with and contributions from special interest groups in our own industry, supplier companies and groups, distributors and allied organizations.

State canners association secretaries have been integrated into the C.& T.R. program, as they are in all N.C.A. activities, on a give-and-take basis. They have been supplied with portfolios of materials called "Canned Treasurers" for local radio and television programs and personal appearances; they have been sent information and recommendations for a "Highway Sign" program to work out with their members; they have been given help in special projects such as the publicizing of the California cutting bee by *Woman's Home Companion* and the exhibit and booklet provided for the Tri-State canners fall meeting. In return, they have helped keep canners informed about the C.& T.R. program by publicizing its activities in their own bulletins urging participation among their own members and providing time on their state programs for the progress report slide presentation shown throughout the fall.

In the field of distribution, almost weekly contact with the Operations Committee has provided a valuable method of communication with leading groups of brokers, wholesalers and retailers. The Operations Committee has been constantly informed of proposed activities, and its members have supplied valuable advice as well as support in the form of bulletins and special consideration in their own fields of activity. In addition, special conferences have been held with retail groups such as Bohack, Gristede, American Stores, A & P, Grand Union and Mick-or-Mack.

Also in constant touch with C.& T.R. activities are representatives of suppliers—American Can, Continental Can, Can Manufacturers Institute, Glass Container Manufacturers Institute, Owens-Illinois, White Cap Co., and Union Bag and Paper.

Since all merchandising tie-ins with publications are arranged through their promotional departments, a conference was held with promotion managers of *Life*, *Look*, *Ladies' Home Journal*, *Good Housekeeping*, *McCall's*, *Better Living*, *Family Circle*, *Parents'*, *Woman's Home Companion*, *Collier's*,

etc. In addition to tie-ins with specific editorial features in many magazines, *Ladies' Home Journal* has promoted the canned foods glamour theme through its "Bellringer" distributed to 2000 retailers, and *McCall's* each month through its "Ad Planner" to S.M.I. members.

Speeches about C.& T.R. have been made to 12 state canners associations as well as the National Restaurant Association and the New York chapter of the American Marketing Association.

*Trade press*—Early in the program a conference was held wtih editors of leading food and grocery publications and business page editors of daily newspapers to explain the C.& T.R. program, answer questions and get opinions of these experts in their field.

Trade paper releases have been distributed whenever appropriate and numbered approximately 25 during the year. These covered editorial events, merchandising projects, announcements of special projects like the "Cost of Handling Study," results of promotions, etc. In addition, the monthly *Trade Information Bulletin* reaches the trade press, and many items it contained have been reported in the press.

Special articles and series of articles have been prepared for the following publications: *Good Field Reporter, Food Business, Tide, Glass Packer, Canning Trade, Canner, Pennsylvania Packer, Good Packaging, Western Canner and Packer, Pacific Coast Review, Journal of Commerce, Modern Grocer, Business Week,* and the *Canned Foods Merchandiser Digest* of Continental Can Co.

Several trade publications are interested in contributing to N.C.A.'s research on canned foods merchandising and selling and will be available for cooperation whenever it is decided to call upon them.

*Research*—Continuing market research at the retail level is provided by the Don White Organization which supplies monthly trade information used in N.C.A.'s *Trade Information Bulletin*. Researchers in 137 cities contribute field work for this project.

Special research projects have included the 16-city report on results of the "Harvest Festival" promotion in conjunction with *American Weekly* and the 29-city study of retailers' attitudes toward net profit.

Following the latter study, a series of some 14 conferences was held with officials of the National Association of Food Chains to define the scope and content of a national Cost of Handling study. This research project was undertaken in October, the first step being a letter to 1,000 retailers inviting their cooperation. This was followed by a series of personal interviews with representatives of 250 retail organizations including independents, chains, voluntaries and cooperatives, this research being conducted by Don White.

The "Philadelphia Project" was planned in a series of meetings with executives of American Stores Co., which offered its full cooperation in providing retail markets as a merchandising laboratory in which N.C.A. can test merchandising theories and techniques. After the project was approved, the next step was to hire a man with the right combination of qualifications to represent N.C.A. in the American Stores organization, to handle the details of merchandising projects and to report results so that they would be of value to both the canning industry and the food retailing industry. After interviewing some 25 men, Kendall Ellrich was chosen for the position and has been at work since January 1 familiarizing himself with the background necessary to proceed.

A series of conferences has taken place with *Life* magazine and the Alfred Politz Research Organization in an attempt to arrive at a format for a mass motivation study which would be of use to the canning industry as well as to the sponsoring magazine.

*Merchandising to members*—A booklet explaining C.& T.R. program objectives, for use in acquainting salesmen and brokers with the program, was the first merchandising tool provided for canners. This was followed quickly by a "Sales Builder Kit" which included examples of consumer editorial materials and a "Plan of Canner Action."

Reprints of editorial materials, together with bulletins recommending ways to utilize them, have been supplied to canners and their brokers in connection with every major editorial feature, including *Woman's Home Companion, Parade, American Weekly, McCall's, Seventeen, Parents'* and *Family Circle.*

Brochures incorporating merchandising suggestions were supplied in the case of *American Weekly, Parade, Seventeen* and *Parents'*. A four-page flier called "NCA's Do-it-yourself Sales Builder" was provided to explain the *Seventeen* and *Parents'* promotions. Booklets reprinting the *McCall's* "How Fresh *Is* Fresh?" article were made available to members at a nominal cost.

*Trade Information Bulletins* are prepared monthly to report to members on current trends in canned foods advertising, promotion and merchandising at the retail level.

A panel discussion on merchandising was a feature of the Annual Convention and assembled food industry experts to discuss the question: "Can the Smaller Canner Merchandise?" and to give canners tips on how to go about it.

*Merchandising events*—Store tests with Shoprite Stores, a group in New Jersey, were set up in connection with the *Woman's Home Companion* editorial feature, and the Eastern Division of National Retailer-Owned Grocers used *Companion's* "Because of Canned Foods, We Eat Better Today" slogan as a promotional theme. N.C.A. in each case provided recipe leaflets in which selected recipes from the article were used. These leaflets were also used as giveaways on television programs. Shoprite Stores reported sales gains of 300 percent to 900 percent for items featured in its displays.

In connection with the *American Weekly* editorial color spread, a "Harvest Festival" canned foods promotion was planned, with a 16-city retail store test for which N.C.A. provided posters, banners and recipe leaflets. Canned foods department sales showed increases up to 14 percent for all products as a result of this promotion.

In the "Teen Cooks Love Canned Foods" promotion of *Seventeen* magazine in cooperation with N.C.A., three chains tied in on a test basis—Food Fair, Stop & Shop, and Kroger. N.C.A. provided recipe leaflets for this promotion, these being used in the stores, in home economics classrooms and as giveaways on the "Home" show over the NBC-TV network. *Seventeen* provided posters and a basic nutrition chart which were also used in both stores and classrooms.

Canned foods merchandising events have been staged by a number of retail organizations as a tie-in with the N.C.A. program. These include Red & White, I.G.A., Pleezing, N.R.O.G. and Gristede Bros.

### Summary

The activities outlined on the preceding pages have been accomplished because of the teamwork and wholehearted cooperation of the entire N.C.A. staff. They have been planned and conducted, too, with the guidance of the C.& T.R. Committee. Specifically, the details have been closely supervised by means of almost daily correspondence and phone calls and by monthly staff meetings in Washington.

The C.& T.R. program is now nearly a year old, with a year of experience behind it. For the most part the activities already undertaken have proven worthwhile, have shown that the program is on the right track. Response from canners, brokers and distributors grows more encouraging daily. The team has worked together enough to become a continually better operating unit.

With this much accomplished, the plan for next year is for more of the same—more editorial tie-ins, more merchandising events, more research, more selling aids for canners. While much has taken place already, we feel next year will prove even more resultful.

# N. C. A. Board Reviews Two Major Association Activities, Approves Reorganization of Research Laboratories

New methods of presentation of Association activities were inaugurated at the meeting of the N.C.A. Board of Directors, Friday, February 18, on the eve of the Convention. The continuous program of the Raw Products Research Bureau was illustrated by slide projection and a panel of speakers in the morning session, and the Consumer and Trade Relations program in the afternoon, before a huge backdrop of samples of the promotional literature being used.

Board members reacted favorably to both presentations and some have requested that other N.C.A. activities be similarly handled at future Board meetings.

### Raw Products Program

In presenting the Raw Products activity to the Board, Executive Secretary Carlos Campbell acted as presiding officer and called on various members of the Raw Products Committee and its Technical Advisory Committee. P. K. Shoemaker first discussed the values and advantages of high-quality raw products in the ultimate production of high-quality finished canned foods, citing the lowering of production costs in the factory and the building of prestige for the canned product.

Mr. Campbell then discussed in some detail how the Raw Products Research Bureau functions and its work with the various agricultural research agencies, state and federal experiment stations. He referred to a colored map of the United States showing location of the important canning crops and stations where experimental work is being conducted on such crops. He described how Dr. Charles H. Mahoney, Director of the Bureau, keeps in close contact with the experiment stations through visits, constant correspondence and personal contact with research personnel at their scientific meetings.

W. Stanley Macklem, Chairman of the Raw Products Committee, then described one project illustrating how the Bureau functions, and Morton Adams spoke on certain aspects of the functioning of the Technical Advisory Committee. Mr. Adams stressed the importance in raw products work of advance planning and showed how effective it is to anticipate and define the problems within the industry. "Our goal," he said, "is tastier and more nutritious foods produced at greater net return to the grower and canner, and at a cost which will insure us a satisfactory competitive position in the food market."

### Promotion Activities

The second presentation of an N.C.A. activity was that of the Consumer and Trade Relations program, during the afternoon session. For this occasion, a huge backdrop had been constructed on which were mounted colored posters, charts, and graphics of various kinds, that illustrated the various efforts made during 1954 to promote canned foods acceptance in the consumer magazines and at the grocery store level and in other directions.

Again Secretary Campbell, as chief administrative officer of the Association, acted as chairman for the presentation. He reminded the Directors that two years ago they had created a Function Analysis Committee to study various N.C.A. activities. He announced that the Claims work analysis had been completed and its chairman, Howard T. Cumming, had reported back to the parent committee and that work on studies of the Laboratory and Statistics activities is in progress.

"A year ago the Board authorized an activity that in a sense is new, but new only in the fact of the employment of professional outside assistance to help carry it out. The basic aim of the National Canners Association, from the start, has been to improve and maintain the public acceptance of canned foods.

"In our Home Economics work we have carried on extensive activities to educate the housewife. Also, in the Information Division we have circulated information to the public that creates a favorable impression of the industry and its products, and have been alert to correct derogatory statements that appear. Through the work of the Statistics Division we have been able to call attention to the 'best buy' aspects of canned foods.

"Thus, when the Consumer and Trade Relations program was authorized a year ago it was logical to select Katherine R. Smith, Nelson H. Budd, and Dr. H. L. Stier, the heads of these respective Divisions, to work with George Anderson and his professional staff of Dudley, Anderson & Yutzy on the details and execution of this program.

"In N.C.A., for many years now, we have been producing a great volume of material that promotes canned foods, but our means of getting this widely to the public were limited by time and money. We needed a professional agency with the 'know-how' and the contacts to get wide distribution and attention to this material. This backdrop of samples proves that we have this fine combination of professional information and professional distribution techniques, along with original and imaginative ideas as to the most effective ways of getting the message across."

Mr. Campbell then introduced George Anderson of the DAY agency, who explained how the team of N.C.A. and DAY staff members has functioned this year, using the *Seventeen* promotion as a case history to demonstrate the integration of all phases of the effort. Mr. Anderson also reviewed the mileposts of the past year's efforts, using the illustrations on the backdrop, and explained the professional reasons for use of the various media that have been provided with promotional material. The C.& T.R. activity report, formalizing all this, is reproduced on page 127 of this issue.

Mr. Campbell then called on Chairman William A. Free, Sr., of the N.C.A. Consumer and Trade Relations Committee, who explained how the Committee, acting on the Board's authorization, had established the policies of the promotion work, and through its technical subcommittee of members experienced in promotion and publicity had advised and directed the activity in 1954. Mr. Free asserted that 1954 represented the biggest volume of promotional activities in behalf of canned foods that he had ever witnessed in his lifetime in canning.

The Board of Directors approved the recommendations of the Administrative Council, brought in by Chairman Louis Ratzesberger, Jr., for a 1955 budget of $1,320,360 which includes continuance of the C.&T.R. program. The current rate of N.C.A. dues—1/10 of a cent per case for seasonal items and 3/10 of a cent per case for nonseasonal—was continued.

## 1956 Convention

The 1956 Convention will be held starting January 18 in Atlantic City, according to the joint agreement of the three sponsor associations—National Canners Association, National Food Brokers Association, and the Canning Machinery and Supplies Association.

A new plan has been worked out that will stagger arrivals and departures of the various groups that make up the overall Convention population, so as to make the most effective use of rooms and parlors. The plan will provide for the desired periods of contact between brokers, their principals, and buyers as well as between canners and their suppliers and permits use of the best hotels by certain groups during the early part of the Convention, and other groups during the later period.

Fred Moss, Chairman of the Home Economics Committee, asked for a motion changing the name of that Division from Home Economics Division to Consumer Service Division, a recommendation arising from a year's study of the advantages that would derive from the new nomenclature. The motion was passed.

Acting for John T. Knowles, Chairman of the Scientific Research Committee, E. J. Draper reported that the Committee, in the interest of more efficient administration and in the hope of possible economies, recommended appointment of an over-all Director for both the Washington and Berkeley Laboratories, and the naming of Dr. E. J. Cameron to the over-all post, with Ira Somers and C. A. Greenleaf being appointed Associate Directors at Berkeley and Washington, respectively. This motion also carried.

The special committees of the Association—Conference, Convention and Procurement—were continued. And the Board also voted to approve the 1955 Industry Boards of Arbitration, appointed by the National Food Brokers Association, United States Wholesale Grocers Association, and the National-American Wholesale Grocers Association.

John Baxter, Chairman of the Labeling Committee, requested Board motions (1) authorizing standardized terms on certain styles of pack and (2) changes in the current text of the Labeling Manual. Both motions were passed. Mr. Baxter's detailed report appears below.

Feature of the Board meeting was the presentation by H. Thomas Austern, Chief Counsel of N.C.A., of "The Washington Scene." This is fully reproduced beginning on page 133.

## N.C.A. Publicity Activities at the Convention

A Press Room was maintained by the staff of the Information Division of the N.C.A. at the Conrad Hilton Hotel throughout the Convention for the use of some 100 newspaper, magazine, radio and TV representatives covering the event.

The Division also arranged a special press conference for Secretary of the Treasury Humphrey just prior to his appearance Saturday morning on the N.C.A. program. Representatives of most of the national wire services and Chicago dailies attended.

Copies of the 50 Convention speeches, summaries, statements and news releases were available at the Press Room during the proceedings. Photos and biographies of speakers and officers were issued also, and the Information staff assisted reporters with background information and in other ways. Much of this appeared in daily newspaper accounts and features in Chicago and elsewhere, as well as on radio and TV newscasts and feature programs. References to the Convention and quotes from its speakers were made over radio stations WBBM, WGN, and WLS, Chicago (two newscasts); WICC, Bridgeport, Conn. (and Yankee Network); WOR, New York City (three newscasts); WPIK, Alexandria, Va.; and WTOP, Washington, D. C. Telecasts were made by WBBM-TV, WBKV-TV (two telecasts), WBKB-TV, and WGN-TV, Chicago.

A special TV program was arranged for by Herb Nelson, Pacific Coast manager of Dudley, Anderson & Yutzy, the professional agency engaged by N.C.A. to conduct the Consumer and Trade Relations program, and was staged February 15, at San Francisco's station WPIX-TV. This was the "PIX Kitchen" conducted by Faye Stewart, and it featured in an interview Everett B. Murphy of the Canners League of California, who told about the annual Fruit and Vegetable Sample Cutting and how it contributes to high-quality canned foods. At the Convention the *Woman's Home Companion* distributed preprints of its article in the March issue, on the cutting bee, containing a front-cover salute to "The National Canners Association and the Canners League of California for Their Constant Effort to Produce Better Canned Food Products for the Consuming Public."

At the close of the Convention the Press Room made special mailings of the Convention papers and releases to about 100 publications throughout the country that did not have representatives in Chicago.

## Report of the Labeling Committee

**By John L. Baxter, Chairman**

Completing the report made at the May, 1954, meeting of the N.C.A. Board of Directors, the Labeling Committee suggests that the Board of Directors recommend the following terms for industry-wide standardization-in-use on the style of pack indicated.

| Product | Term Recommended |
|---|---|
| Beets | Shoestring (but where necessary the terms "French Style" or "Julienne" may be used in addition—on a temporary basis and preferably in parenthesis.) |
| Carrots | Shoestring (but where necessary the terms "French Style" or "Julienne" may be used in addition—on a temporary basis and preferably in parenthesis.) |
| Potatoes | (Not sufficient evidence of canners' interest in any of the permissible terms to warrant a recommendation). |

On Pages 189 and 190 of the N.C.A. Labeling Manual delete the terms in the column headed "Size" and substitute for them the following terms:

| Early June | Sweet | Definition |
|---|---|---|
| Tiny or Petit Pois | Tiny or Petit Pois | 1 sieve |
| Small | Small | 2 sieve or 2 and 1 |
| Medium small | Medium Small | 3 sieve |
| Large | Medium | 4 sieve or 3 and 4 |
| Large | Large | 5 sieve or larger |
| Mixed Small Sizes | Mixed Small Sizes | A combination of sieve sizes 1, 2, and 3 |
| Mixed Large Sizes | Mixed Large Sizes | Any combination of sizes predominantly 5 sieve and larger in Sweet peas; 4 sieve and larger in Early June peas |
| Mixed Sizes | Mixed Sizes | Other combinations of 3 or more sieve sizes |
| Garden Run | Garden Run | Unsorted for size and no sizes removed |

Also make the same substitution at the bottom of page 190 under section entitled "Tests."

On Page 191 of the N.C.A. Labeling Manual, delete the material which appears in the block under the caption "Wisconsin State Requirements" and substitute for it the following statement:

"The following labeling requirements for canned peas sold at retail in the State of Wisconsin (no matter where they were packed) became effective on August 1, 1953."

| Labeling Terms for Pea Sizes | Definition |
|---|---|
| Tiny | 1 sieve |
| Small | 2 sieve or 2 and 1 |
| Medium | 3 sieve, or 4 sieve, or 3 and 4 |
| Large | 5 sieve and larger |
| Mixed Sizes | Any mixture of three or more sizes |
| Garden Run | Not sorted for sizes and no sizes removed |

Also delete all figures given for Sweet Peas in chart entitled "Percent Alcohol Insoluble Solids" and substitute for them the following:

Under column heading "Size"
"All Sizes"

Under column heading "Very Young"
"Up to 12.5%"

Under column heading "Young"
"12.6 to 16.5%

Under column heading "Nearly Mature"
"16.6 to 21.0%

## Officers Elected by Other Associations

Officers of other trade associations elected at their annual meetings during the Convention period are:

### Canning Machinery and Supplies Association

President—E. N. Funkhouser, Dewey & Almy Chemical Co., Cambridge, Mass.; vice president—C. K. Wilson, Food Machinery & Chemical Corp., San Jose, Calif.; secretary-treasurer—W. D. Lewis, Washington, D. C. (all reelected).

### The Forty Niners

President—M. R. Feeney, Lansing B. Warner, Inc., Chicago; vice president—David S. Nay, Wm. J. Stange Co., Chicago; secretary-treasurer—Frank S. Langsenkamp, F. H. Langsenkamp Company, Indianapolis (all reelected).

### National Food Brokers Association

National chairman—Truman F. Graves, Graves-Chambers Co., Seattle; first vice chairman—Walter H. Burns, Sr., Walter H. Burns Company, Inc., Pittsburgh; second vice chairman—George E. Dillworth, Kierce & Dillworth, Inc., Detroit; third vice chairman—Jean N. Bistline, Bistline Brokerage Company, Denver; member-at-large—W. Sloan McCrea, Earl V. Wilson Company, Miami; treasurer—Harry E. Cook, The Harry B. Cook Company, Baltimore (reelected); president—Watson Rogers, Washington, D. C. (reelected).

### National-American Wholesale Grocers Association

President—Ned Fleming, The Fleming Co., Topeka, Kans. (reelected); chairman of the board—French Fox, Fox Grocery Co., Charleroi, Pa. (reelected); vice presidents—C. O. Peterson, Alfred M. Lewis Co., Riverside, Calif.; Julian Ragland, C. B. Ragland Co., Nashville, Tenn.; Bruce Edenton, J. C. Edenton Co., Jackson, Tenn.; and Henry Dean, Scrivner-Stevens Co., Oklahoma City; treasurer—J. Stanley Seeman, Seeman Bros. Co., New York (reelected); executive vice president—Ralph B. Johnson, New York (reelected).

### National Preservers Association

President—W. Kyrel Meschter, American Preserve Company, Philadelphia; vice presidents—Paul Smucker, The J. M. Smucker Company, Orrville, Ohio (reelected); A. H. Blount, Tea Garden Products Co., San Leandro, Calif. (reelected); and J. N. Major, Jr., Old Virginia Packing Co., Inc., Front Royal, Va.; secretary-treasurer—John C. Fosgate, Chester C. Fosgate Co., Orlando, Fla. (reelected); executive vice president—Richard F. Curry, Washington, D. C. (reelected).

### Associated Independent Canners

President—John P. Kraemer, Mammoth Spring Canning Co., Sussex, Wis. (reelected); vice presidents—J. I. Smith, Jr., The Esmeralda Canning Co., Circleville, Ohio, and G. Bartol Silver, Chas. B. Silver & Son, Havre de Grace, Md. (reelected); secretary-treasurer—G. E. Jones, Columbia Canning Co., Cambria, Wis. (reelected); assistant secretary-treasurer—Harvey R. Burr, Madison, Wis. (reelected).

### Tomato Council, Inc.

President—Charles B. Silver, II, Chas. B. Silver & Son, Havre de Grace, Md.; vice presidents—Earl T. Daniel, H. T. Daniel & Sons, Deltaville, Va.; Harvey Jourdan, B. G. S. Jourdan & Sons, Darlington, Md.; Ernest H. Langrall, J. Langrall & Bro., Inc., Baltimore; Robert W. Phillips, J. Richard Phillips, Jr., & Sons, Inc., Magnolia, Del.; Lewis E. White, The Clyde Kraut Co., Clyde, Ohio; G. A. Turmail, Bluffton Foods, Inc., Bluffton, Ind.; W. Allen Markham, Markham Bros. Co., Okeechobee, Fla.; Joseph S. Gugino, Lawtons Canning Co., Inc., Lawtons, N. Y.; and Newlin B. Watson, R. S. Watson & Son, Greenwich, N. J.; treasurer—Wilson M. Jarboe, Harrison & Jarboe, Sherwood, Md. (reelected); executive secretary—Linwood C. Yates, Centreville, Md. (reelected); marketing advisor—John Dingee, Can Manufacturers Institute, New York.

### Old Guard Society

President—Ogden S. Sells, Los Angeles, Calif.; first vice president—Theodore J. Marquerite, Franklin-MacVeagh Co., Chicago; second vice president—H. J. Barnes, Kaysville Canning Corp., Kaysville, Utah; secretary-treasurer—John Dingee, Can Manufacturers Institute, New York (reelected).

### Young Guard Society

President—Robert L. Eirich, H. S. Crocker Co., Inc., Baltimore; first vice president—J. Ed Raley, Jr., Raley Brothers, Inc., Atlanta; second vice president—Ned Tempas, Green Giant Company, Beaver Dam, Wis.; secretary-treasurer—Herb Shek, H. S. Crocker Co., Inc., Baltimore (reelected); recording secretary—Arthur Judge, Jr., *The Canning Trade*, Baltimore (reelected).

### Association of Canners State and Regional Secretaries

President—J. Overby Smith, Texas Canners Association, Weslaco; vice president—John W. Rue, Tri-State Packers Association, Easton, Md.; secretary-treasurer—Warren R. Spangle, Indiana Canners Association, Indianapolis.

## Young Guards Honor Budd

Nelson H. Budd of the National Canners Association was presented with a special engraved scroll at the annual Convention Dinner of the Young Guard Society, February 21, at Hotel Morrison, Chicago. Text of the tribute reads as follows:

"Resolution of Appreciation.

"*Whereas*, Nelson H. Budd, Assistant Secretary and Director of the Information Division of the National Canners Association, through his wide experience, deep understanding and cooperation, has contributed greatly to the affairs of the Young Guard Society, as well as the Canning and Allied Industries. Therefore,

"*Be it Resolved:* That we, The Young Guard Society, assembled at Chicago at our 22nd Annual Meeting, February 20, 1955, do express our genuine gratitude and sincere appreciation to Nelson H. Budd, in this form of tribute, and

"*Be it Further Resolved* that the future hold in store for him, health, happiness and success, which he so richly deserves."

The Young Guard Testimonial Committee that worked out the details of the scroll and presentation consisted of Ed. F. Woelper, chairman; W. Ennis Parker, and Arthur Judge, Jr. William A. Free, Sr., made the actual presentation, reading the text to the audience.

## 49'ers Second Service Award Presented to Dr. J. C. Walker

Dr. John Charles Walker, plant pathologist at the University of Wisconsin, was presented the Second Annual 49'er Service Award, at special ceremonies at the Sheraton-Blackstone Hotel, Friday, February 18, in recognition of his outstanding contributions to the canning industry. Immediately thereafter, Dr. Walker was guest of honor at the 49'ers Sixth Annual Reception where he was presented to all 49'ers and especially invited guests, among them the officers and some of the staff of N.C.A.

Dr. Walker, as the recipient of the Second Annual Service Award, follows Dr. Samuel K. Prescott of Massachusetts Institute of Technology, who was the recipient of the First Annual Service Award. Dr. Walker is well qualified to follow the esteemed Dr. Prescott as a recipient of the 49'er Service Award. His achievements include important work on the develop-

ment of disease resistant seeds for commercial crops of cabbage, onions, peas, beans, beets, and cucumbers for pickles. He is the author of more than 300 scientific works. He has appeared several times on the program of technical sessions on raw products problems at the N.C.A. Convention.

Dr. Walker has been professor of plant pathology at the University since 1928, was president of the American Phytopathological Society in 1943, and also has been a member of many other scientific groups, including the National Research Council.

The Award to Dr. Walker was presented by M. R. Feeney, president of the 49'ers, following eulogies by Dr. Roger Lueck of the American Can Company, and J. Olney Brown of Squire Dingee Co. The 49'ers have arranged for reproductions of the presentation and acceptance speeches and canners interested in receiving copies should address their request to the Information Division, National Canners Association, 1133 20th Street, N. W., Washington 6, D. C.

## Convention Publications

Certain publications are prepared annually by the N.C.A. for distribution and use at the Annual Convention.

Among these this year was the official *Convention Room Directory* (144 pages), distributed on Friday, February 18. This included all the listings of members of the N.C.A.; state, regional and commodity association headquarters; members of the N.F. B.A. and their noncanner principals; members of the C.M.& S.A. along with their exhibit booth locations; and miscellaneous delegates housed by the three sponsor associations. The directory also included locations and phone numbers of the principal Chicago hotels, a map of the city, floor plans of the exhibit locations, and phone numbers and locations of the various information and registration centers. The directory was published by courtesy of the Chicago Convention Bureau. The editorial and production supervision of copy prepared by the three sponsor associations was carried out by the N.C.A. Information Division.

The Information Division also produced the official N.C.A. *Convention Program* (24 pages) giving agenda details of the several program sessions held by the Association, as well as daily hour-by-hour records of the principal events of the over-all Convention.

## Convention Proceedings

*(Concluded from page 37)*

better than average to offer in the way of superior quality or lower price. And the label is very important. "We have turned down many new items with no more than passing interest in the contents of the can," she declared, "because the label was unattractive."

Buyers want to know that your label is in the market to stay, Miss Coleman told the canners. They cannot afford to stock new items, see a demand built for them and then be unable to buy them another year. Another precept is to offer your merchandise all year around because warehousing space will not permit a buyer to buy a year's supply at one time. And sell the buyer what he wants and needs, not what you want to sell him. In everything you do, build confidence in your firm and its integrity, she said.

The fight for retail shelf visibility is actually a fight for retail salability, Lyman L. Weld, Feature Merchandising, Inc., Chicago, declared. The smaller canner can compete successfully if he provides practical display materials, new ideas and a method for getting his materials used and his goods displayed. Somebody has to go into the store, build the displays, and police the shelves in order to be sure of visibility.

Mr. Weld believes that the smaller canner does best if he takes one volume-opportunity specialty and concentrates on it, advertising it, demonstrating it, promoting it, making it the locomotive to pull his whole train of cars. He may concentrate on pork and beans, or corn, or asparagus, or peaches, but in any case he establishes a reputation for good products. And he keeps up the pressure on his leader until he gets into an unassailable position of dominance in the market.

Product activation at the point of sale is extremely important since 80 percent of all grocery store sales are made in self-service stores, Ralph Head, Batten, Barton, Durstine & Osborn, New York City, told the canners. Activating your product can be done with merchandise alone, with better labeling, better position and prestige. Add such a simple thing as a shelf talker at the point of sale, and the effectiveness of the other factors is multiplied, he said.

Mr. Head advised smaller canners to select brokers and advertising media with care, take advantage of all materials offered by their national and product associations, and make an expenditure for advertising and point of sale a part of their budget just as production is a part of it.

Canners should be less silent—or more vocal—in talking to food editors, Grace M. White, food editor of *Family Circle*, New York City, told them, since food editors are a vital link between the canner and his customers. Tell them about new products, new facilities, anniversaries, other local plant news.

Canners also talk to the consumer through their labels, she pointed out, advising canners to make their labels attractive, simple and informative.

### The Institutional Market

Immediately following the merchandising panel, a session jointly arranged by the N.C.A. Division of Statistics in collaboration with the Can Manufacturers Institute was held on the subject of the institutional market. First speaker was Harold H. Jaeger, Director of the C.M.I. Marketing Bureau. Illustrating his talk on "Restaurants—a Billion-Dollar Market for Canned Foods" with color slides derived from a study conducted for C.M.I. by Nejelski & Company, management counsel, Mr. Jaeger showed that away-from-home eating is growing more and more important, due to increases in population and the new concept of leisurely living.

The study showed many fields where institutional food-buying habits and preferences are vital to canners everywhere. Restaurants, for example, will buy about $900,000,000 worth of food this year; almost twice the amount will be spent on canned foods as is spent on frozen. But frozen foods' share of the market is increasing.

Canned foods gain the votes of restaurant owners on many counts, but restaurateurs consider only a few of those important. On the other hand, frozen foods were considered superior to canned in several vital qualities.

The service given restaurant buyers by their wholesalers and suppliers was emphasized in the Nejelski study—not always in favor of suppliers of canned foods. Buyers felt a need for more frequent visits from their suppliers—but not for too-frequent calls. They were most alert to certain salesmen's good qualities.

There is a real need, Mr. Jaeger indicated, for the canner in turn to help his wholesalers, showing them how to sell more by furnishing more personal service, and to make sure that their products are precisely as specified on the label.

While the restaurateur, like the housewife, prefers fresh and frozen to canned foods on the basis of taste and appearance, the acceptance of canned foods is increasing. It can be increased still more, not only by attention to quality but by forms of assistance in the matter of cost control.

Canners should be on the lookout for a changed attitude toward their products on the part of restaurant and institutional customers, stated Leo

### Call for 1955 Directory Copy

Questionnaire forms on which canners are asked to submit information for the compilation of the 1955 edition of the *Canners Directory* were mailed to all canners on February 23, and should be on canners' desks when they return from the Convention. These forms should be filled out and returned promptly to the N.C.A. in the self-addressed, postage-paid envelopes provided.

As in past editions, the 1955 Canners Directory will list the name and main office address of each canning firm, location of factories operated by each firm in each state, and the canned food products packed by each firm in each state. Canners are asked to list the states and the cities and towns in which their canning plants are located, and to identify their products clearly by generic name.

Nejelski, in his talk, titled "Important Trends in the Restaurant Industry."

Mounting costs, tougher competition, and personnel problems will lead to changes in restaurant operation which will in turn affect their attitude toward canned foods. Mr. Nejelski listed seven points of special interest, showing what they mean to canners:

Kitchens will become smaller, because of the cost and difficulty of finding qualified help. The market for pre-processed foods will grow.

Restaurant owners will pay closer attention to strict cost control, as food and operating costs mount.

Canners will want to watch the increase in labor-saving equipment used in restaurants. Improved food equipment creates a market for canned food manufacturers that take advantage of it.

The trend toward self-service, which is enforced by rising labor costs, will continue to mount. In addition, more restaurant men will work to increase between-meal sales, to even out their mealtime production peaks, and more will begin to feature "take-out" food sales.

Mr. Nejelski showed how each of these factors, as well as the over-all growth in the restaurant industry, affects the canner who wants to maintain or increase his sales to it.

Mr. Nejelski then led a panel discussion on "How Canners Can Get a Bigger Share of the Institutional Market," which featured statements and comment by the following experts:

George D. Hanby, Cooley's Cupboards, Evanston, Ill., "Cost and Quality Factors that Are Important in Choosing Foods;" Beatrice Hughes, Harding's Restaurants, Chicago, Ill., "Label Information that Is Most Useful to the Restaurant Operator;" Joseph Schensul, Schensul's Cafeteria, Kalamazoo, Mich., "Fruit and Vegetable Specifications that Are Most Important to Restaurants;" Ora Chidester, John Sexton & Co., Chicago, "Canner-Wholesaler Relationships that Produce Maximum Institutional Sales."

The institutional market session wound up with a major address by Dr. H. Wayne Bitting, of the Agricultural Marketing Service, U. S. Department of Agriculture, Washington, D. C., on "Canned Foods Usage by Restaurants and Cafeterias."

All of the papers delivered at both the Merchandising and Institutional Markets sessions are reproduced in full from pages 46-62.

#### The Scientific Meetings

The chief technological problems of today's canning industry were taken up at three Canning Problems Conferences during the Convention, arranged by the N.C.A. Research Laboratories. The last of these, held on Monday, February 21, dealt with "Quality Grading and Washing" and was jointly sponsored by N.C.A. and the Canning Machinery and Supplies Association. Roger Lueck, vice president in charge of research, American Can Company, New York City, was the presiding officer and the speakers were drawn from the ranks of canners and machinery manufacturers.

"Canning Procedures and Products" was the subject of the first of the Canning Problems Conferences on Saturday afternoon, with Randall Royce, American Can Company, Maywood, Ill., presiding, and the second, held on Sunday afternoon, covered the "Factors Influencing Shelf Life of Canned Foods." W. J. Mutschler, Research and Development Department, Continental Can Company, presided.

All of the technical papers presented in these three sessions are reproduced in full in this issue, pages 63-99.

Besides the Raw Products session on canner-grower relations reported above, this division of N.C.A. conducted a Sunday afternoon conference dealing with agricultural marketing problems with Mark H. Mitchell of The Larsen Company presiding, and jointly with the N.C.A. Laboratory, conducted a program on "Pesticide Tolerances—Their Effects on Raw Product Procurement and Factory Operations," with Dr. Charles H. Mahoney, Director of the N.C.A. Raw Products Bureau, presiding. All of the raw products papers also are reproduced elsewhere in this issue (see pages 99-111).

"Effective Management of Marine Fisheries—When Is It Necessary and How It May Best Be Accomplished" was the subject the seafood group dealt with in their special session on Sunday. Presiding officer was Arthur H. Mendonca of the F. E. Booth Co., San Francisco, Calif., who is Chairman of the N.C.A. Fishery Products Committee. The fish session papers also are reproduced in full (see page 125).

### Special Convention Appearances

Special appearances were made during the Convention by officers and staff members of the N.C.A., as follows:

President George B. Morrill, Jr. delivered a eulogy at a special breakfast meeting February 20, sponsored by the National Cranberry Association to honor the retirement of Marcus L. Urann.

Dr. H. L. Stier, Director of the N.C.A. Division of Statistics, spoke on the "Supply and Demand Situation for Canned Peas and Corn" at the annual meeting of the Associated Independent Canners on February 21.

Miss Katherine R. Smith, Director of the Home Economics Division, was a guest in a 15-minute interview on the Helen Joyce program ("The Femme Show") of WGN-TV on February 17.

### Convention Issue

This issue of the Information Letter is devoted to the procedings of the 48th Annual Convention of the National Canners Association, in Chicago, February 19-23.

This 112-page issue compares with the previous record-size 100-page book published in 1954. It is in the mail within 10 days after the close of the Convention.

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